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## EDITORIAL NOTES.

### An Unwarranted Attack on Continuous Verticals.

UNDER this heading in our issue for May 13, criticism was made of an article which had appeared in the "Journal für "Gasbeleuchtung," and which, in view of available information from installations of the Woodall-Duckham continuous carbonizing system other than that at Lausanne, struck us, as it must have done others, as a singular production, having for its only and definite purpose an injury to the system. However, what purports to be a reply to the criticism offered by us appears in our contemporary for the 28th ult. Futility runs through this so-called reply. It seems, as we anticipated was the case, that the article in question was contributed to the German "Journal," which accepted it as coming from a completely disinterested source—so "dis- "interested" that there was no hesitation on the part of the author in taking the courageous part of throwing mud from behind a hedge! The reply contains an extract from "La "Tribune de Lausanne," with the view of supporting the contentions of the author of the original German article. But what it discloses more than anything else is that the responsible person did not fairly represent the position referring to the change at Lausanne from the small-section retorts to the chamber retorts. It is now said that the original article contained only a personal, though objective, expression of opinion. We have different points of view; and we cannot agree that an article making allegations which, in the form presented, were not true, can be said to contain "only a personal, though objective, expression of "opinion."

It seems to us to be suggested that hardly anyone could seriously deny that the results of "tests" [why tests?] with the Woodall-Duckham system hitherto published were not free from objection, as "no results, to the best of our "knowledge, have been made known which have been ob- "tained by any official institute, such, for instance, as the "one at Karlsruhe." Only such results, "however, as con- "tained, besides bare figures, information of general interest "on the working of the plant, &c., could be regarded as free "from objection." Why does not our contemporary's contributor say, as we gave him a fair opportunity of saying, outright whether or not he questions the *bona fides* of those British engineers who have published working results. To us, the argument of the contributor is most amusing. We cannot see, and the critic does not explain, why the results of working under practical conditions, published by competent engineers in daily touch with the operation of the settings, should not be regarded as free from suspicion or objection. While, too, we have the greatest respect and admiration for the work that is carried on at Karlsruhe, we prefer in this particular matter the authentic results of daily practical working.

On the point as to the nitrogen content of the gas, it is stated that the published figure of 7·76 per cent. of nitrogen cannot be true for the Dessau retorts at East Hull as it is "absolutely impossible, under normal working conditions "of the moulded retorts." The writer in our German contemporary would like to know if there is not something else that contributes to the nitrogen content of the gas at East Hull? All we can immediately say is that the Engineer of the East Hull Company is our authority for the figure, and that in Mr. Dru Drury's paper, before the Institution of Gas Engineers in 1911, some of the figures for nitrogen were between 7 and 8 per cent. But it is further suggested that "no one will infer from the figures in the 'JOURNAL' that "the brick-built carbonizing chambers, sometimes open at "the top and sometimes at the bottom, are less sensitive in "working than ordinary retorts." Looking at the contiguity of the references to the moulded retorts and the brick-built retorts, the writer obviously desires a comparison to be drawn detrimental to the latter; and we are inclined to the opinion that he does not know much about the system of brick-built retorts. As a matter of fact, we believe that the lower half of the Dessau retorts is now being brick constructed; the upper half only being moulded. Moreover, the bricks employed in the Woodall-Duckham retorts are tongued and grooved, which prevents the cracking so often seen in other forms of retort, as well as leakage. The writer of the "reply" goes on to say that quite recently he was again reminded, in well-informed quarters, of the sensitiveness of the English system in respect of nitrogen. Why not say what quarters they were? Is there anything to be ashamed of in owning to responsibility for the statement, if it be true?

Passing on, the author of the German article says the reason he took the Lausanne installation was that he was better informed in regard to it than any other. If he is not better informed upon it than his article showed him to be, then, on his own admission, we are entitled to say that his information concerning other installations must be of a very meagre and even negative nature. As already pointed out, in his defence, the writer of the article quotes from "La "Tribune de Lausanne." It will be remembered that he alleged in his original article that "the English contractors "went a long way to meet the Lausanne authorities" in the matter of exchanging the small-section retorts for the chamber ones. If "La Tribune de Lausanne" was in the possession of the writer at that time, he knew perfectly well that the Municipality were asking for a loan of 150,000 frs. for the reconstruction of the six settings; and he should have said so, and not represented the contractors as bearing a large part of the expense. We repeat emphatically that the Municipality are paying adequately for the alteration, though naturally the contractors have undertaken to do all in their power to realize from the changed conditions the maximum of success. There is nothing in "La Tribune de Lausanne" at all antagonistic to our former contentions; there is to the original statements that appeared in our German contemporary—at all events, there is nothing there to justify the condemnatory and arbitrary statements that first appeared. The whole position can be summed up in very few words. When the contract for the installation was first let, one political party was in power in the Lausanne Municipality. Almost as soon as the work was completed, the opposite party gained office—the result being that the gas engineer resigned, and the whole *personnel* of the works was changed. It is not denied (we made this clear in our former article) that the small retorts handled with difficulty the exceedingly dusty French coals that the Municipality were buying, which coal is troublesome to deal with in any system of vertical retorts. The retorts also suffered through being considerably overheated while in the hands of the Municipality; and the latter have taken upon themselves the whole responsibility for this, and relieved the contractors of all obligation. We repeat that the Municipality are paying the contractors in full for the alteration from small to large retorts. That is the whole story; and if the writer in our German contemporary was (as he professes to be) intimately aware of the facts apart from anything that may have appeared in "La Tribune "de Lausanne," then he must have had some ulterior object in originally giving a perverted view of even the story as published locally.

In the "reply" there is also a taunt as to the continuous system not having reached finality. If the critic is a technical man, that is both an unworthy and a senseless point to make. What is there humanly devised and shaped of which we can confidently say that finality has been reached? Improvement realizing greater economies grows from experience and experiment. It has been so in the Dessau system of carbonization, and must be so in all other systems.

While writing thus, a protest should be made against the very dilatory manner in which the "reply" in our German

contemporary has been produced. It has taken six or seven weeks to prepare and publish it; and revival of the subject at extended intervals cannot, by any twist of the imagination, be described as fair treatment of the Woodall-Duckham system. Moreover, the answer made by us to the original article has not been published in the German journal; so that, with the scanty and incoherent explanation given in the reply as to the points made by us, readers of our contemporary will have very inexact knowledge as to the nature of these points. In our criticisms, we have been careful to afford a fair indication of the statements which have given rise to them. It is not just to the Woodall-Duckham system to proceed in this fashion; and therefore we invite the person who made what we consider, under the circumstances, is an ill-natured attack, if he has anything more to say regarding our comments, to come out of his hiding-place, and deal with the matter promptly and directly in our columns.

## German Association Meeting—More as to the "Athion" Process.

THE recent proceedings at the annual general meeting of the German Association of Gas and Water Engineers, as reported in our columns last week, did not fall short of the standard of high excellence which has been set by past meetings of this Association. The attendance, it is true, was numerically weaker—probably because Strassburg lies only just within the confines of the German Empire. Moreover, it is on the side most distant from the largest of the other German-speaking countries, from which many gas and water men ordinarily come to swell the numbers at the meetings of the Association, which stands *in loco parentis* to the Austrian and Swiss Associations. But with few exceptions all the more active and distinguished gas and water engineers of Germany were present; and the technical proceedings attained a high level.

Among the communications relating to gas supply, Herr E. Körting's paper on "Gasholders" proved highly suggestive in regard to the weight of material used in modern gasholders, and its relation to their cost and safety. It contained also an account of the difficulties with which the Imperial Continental Gas Association have been faced in completing the construction of their 5½ million cubic feet gasholder at Schöneberg, Berlin. For three years, a campaign of obstruction was conducted in the press and elsewhere against the completion and use of this holder, and was supported by astounding arguments and statements by experts so-called, which had the effect of thoroughly alarming the people living in the vicinity. Ultimately Herr Körting vindicated his position in erecting the gasholder, and obtained the approval of the local authorities and the Minister of Commerce and Industry to its retention. But had the design and construction been less sound and the factor of safety smaller, there is little doubt that the gasholder would have been erected in vain, and the Imperial Continental Association would have been restrained from using it. The Hamburg gasholder disaster was in large degree responsible for the agitation. It was naturally difficult to convince the public that this disaster had been due solely to mechanical defects, which were guarded against in the Schöneberg gasholder. The moral is that the prestige of the whole gas industry and its freedom in technical matters are damaged immensely by a single case of faulty construction. With the triple warnings afforded by Hamburg, Vienna, and Ilkeston in mind, we are glad that Herr Körting has now drawn attention to the necessity for a proper supervision of the design and construction of gasholders.

Other papers at Strassburg of great interest to gas men, as will be seen in other columns and in the translation of Herr Kuckuk's communication given last week, included two on the new "Athion" (alkalized cellulose) process for the extraction of carbon bisulphide from gas. The experimental plant at the Heidelberg Gas-Works, in which the process has been proved, was inspected by our representative after the conclusion of the Strassburg meeting; and it was found to be on a sufficiently large scale to warrant the deduction that there would be no obstacle to the working of plant for purification by the "Athion" process of the total make of very large works. There are no mechanical or chemical difficulties involved in the application of the process, but particulars are as yet wanting as to the cost. It is gratifying to our national pride to recall that the "Athion" material was discovered by our countrymen, Messrs. Cross, Bevan, and Beadle, and that the only other practical alternative to the use of lime—the Evans catalytic process—has also been conceived and perfected in this country. However, in reference to Herr Kuckuk's paper, it should be mentioned that a slight error occurred in the abstract of it in last week's "JOURNAL." The small vessel which follows the scrubber in which the gas is sprayed with a solution of potassium carbonate in the Heidelberg experimental plant, contains a solution of caustic potash with or without admixture of potassium carbonate, and not simply a solution of the latter salt.

The Heidelberg experimental plant is on the scale of a small works' plant. Its capacity is limited by the size of the experimental meter by which the gas passed through the plant is measured. This meter is relatively small; and hence we understand that the plant deals only with about 50,000 cubic feet of gas per diem. But since the run with it was started some time ago, a large volume of gas all told has been dealt with. The trials appear to have been on a sufficiently large scale to warrant the belief that there is no restriction, on the score of unwieldiness or complexity of plant, to the adoption of the process on a full working scale at large works. The process seems feasible in all respects, provided the reduction in the amount of sulphur compounds is held to justify the expenditure on "Athion," and on the plant, as well as the concomitant extraction of carbonic acid from the gas. Probably most gas engineers in this country will be largely influenced in their attitude towards the "Athion" process by considerations of the economic advantage or otherwise of the retention of the carbonic acid in the gas. It is a question, now that illuminating power is not the predominant criterion of the quality of gas, whether, in any circumstances, it will be advantageous to the gas undertaking or to the gas consumer to have carbonic acid—amounting to 2 to 3 per cent. of the volume of the gas—extracted. It is practically certain that, even if the carbonic acid can be recovered as a marketable bye-product, the receipts from its sale will not cover the whole cost of its extraction; and it becomes a question whether (say) 975 cubic feet of gas free from carbonic acid are more valuable to the consumer than 1000 cubic feet of gas containing 25 cubic feet of carbonic acid. Theoretically indeed carbonic acid is an objectionable ingredient of coal gas; but it is an economical point for the consumer and his advisers to decide how much he is justified in paying for the luxury of its extraction. The sulphur compounds can now be dealt with by the catalytic process, without preliminary extraction of carbonic acid from the gas, as Mr. Carpenter's paper in last week's "JOURNAL" amply demonstrates. It is chiefly on the ground of its inapplicability to coal gas containing carbonic acid that we fear that the "Athion" process of sulphur purification will fail to secure extensive adoption. This opinion can hardly be affected by the cost of working the "Athion" purifier, apart from the cost of the preliminary extraction of carbonic acid; but we shall look forward with interest to the publication of figures for the cost of working the process at Heidelberg as soon as they have been definitely ascertained. We believe that "Athion" prepared for use should cost £10 to £12 per ton.

Among the remaining communications, it is worth recalling that Professor Hans Bunte lectured on "Surface Combustion," with special reference to the Bone and Schnabel applications of the principle; and that his son, Dr. Karl Bunte, gave a long and interesting paper on the "Practical Development of the Heating Arrangements of Retort-Settings."

Not the least valuable of the work dealt with at the German meetings is that embodied in the reports of some of the Technical Committees of the Association. Especially interesting this year is the report of the Committee which is responsible for the Instructional and Experimental Works at Carlsruhe. Our representative visited these works on the Saturday following the meeting, with a party of about forty-five other technical men returning from Strassburg, and was gratified to find that, in the interval of four years since his previous visit, both the equipment and the staff of the works have grown enormously, and that a greater variety of work, much of it of a high order of scientific excellence, is now being carried on. Of the activity of the staff last year, ample evidence is given in the report of the Committee. We need only direct attention especially to the investigation of methods of testing gas-cookers, in which the Swiss Association has collaborated. An attempt has been made to frame a standard method of

testing the efficiencies of gas cookers; and while some of the proposed rules for conducting the tests seem open to adverse criticism, it is well that attention is being given by the German Association to a matter of such paramount importance to the gas industry and the gas consumer. Perhaps this valuable work of the Carlsruhe works will instigate similar investigations in this country of the efficiency of gas cookers. We believe very little has been done in this direction hitherto; and fuller knowledge of the factors which govern gas-cooker efficiency will be of immense benefit to both the makers of the cookers and the gas undertakings which supply them to users.

## Körting on Gasholders.

OUTSTANDING in the proceedings at the German Association meeting is the lecture (*ante*, p. 37) by Herr E. Körting, on the construction and use of gasholders. It is highly interesting to have the thoughts of an engineer of such calibre as Mr. Körting on a constructional subject of this kind—thoughts covering much ground (past, present, and future), and in character both general and technical. There are one or two points in the former category that are particularly interesting. Mr. Körting draws attention to the progressive lowering, per unit of capacity, of the cost of holders with their growth in size. This has been done despite in these days the greater expense of material and labour; and, in the name of gas engineering, the point ought to be made that the major part of the saving that has been effected has been due to engineering ability and discernment, the exercise of which strengthened the boldness and enterprise of such engineers as Sir George Livesey, Mr. W. H. Bradley, of New York City, and others. To a minor extent, the lowering of cost has been due to the competition between contractors, which, Mr. Körting rightly says, has caused some of them "to resort to the limits of light construction." Competition may have had a more important effect on the Continent; but in this country it certainly cannot be credited with any large part in the lowering of the cost of gasholders. On the other hand, far be it from us not to give the gasholder builders their share, and it is a large share, of credit for the technical advances that have been made in gasholder design, and which have contributed to rendering possible the immense gas-containing structures existing to-day. From technical advance, therefore, both from the side of the gas-engineering profession and from that of the builders, and from the enterprise of the former in rising to greater capacities, has come the reduction of cost. We are nevertheless forced to agree that certain Continental gasholder catastrophes have revealed deficiencies supporting the view as to competition having been the cause of skimping material, which has produced the defects to which has been traceable the disaster. The Ilkeston accident was perhaps more a question of quality of tank materials, and misplaced confidence in certain tests and analyses, than radical defect in design, though there again the result of inquiry, and criticism of the strength of the tank parts, will be, and has been, the retracing of steps towards a greater margin of safety than has been, during the past few years, customary on the part of some gasholder constructors.

This brings us to the point made by Mr. Körting, that, in the case of municipal ownership of gas-works, one is faced with the difficulty that, if the lowest tender is not accepted, there is troublesome public criticism, while, if the lowest tender be accepted, the danger of unreliability may menace. It is, however, more difficult than ever to fix anything that may be looked on as being an approximate standard of cost for a given capacity of gasholder. The prices of materials are ever shifting; labour demands and costs incidental to employment have an instability about them that upsets one's calculations; design, foundations, and geographical position vary—one and all are disturbing factors in arriving at any approximately standard costs. Yet not all engineers have the necessary knowledge and experience to establish for themselves what would be a fair cost, under current and local circumstances, in order to obtain a holder that shall be, probably, a better investment in the end than one the cost of which was somewhat lower. On this ground alone, there is strong reason for, where it does not already exist, competent expert advice to prevent competition affecting the realization of good value, and to form a groyne upon which the municipal pseudo-economists can expend torrential talk over the non-acceptance of the lowest tender.

Another point apparently awakened in Mr. Körting's mind by various holder disasters is that it appears to be clear that the only way for the majority of gas-works to obtain perfect assurance in the case of gasholder construction is to employ an engineer and mathematician specially accomplished in such work to test everything, and to insist on a good factor of safety. Not only so, but reliable chemical and physical tests of the materials to be used must be obtained, to see that their qualities come well within the standards. It is not sufficient—this bears upon Mr. Körting's sixth practical hint for building large holders—to put the sheets to test "longitudinally and latitudinally." In addition to tests for physical strength, there must be (this was one of the lessons of the Ilkeston inquiry) chemical tests to ascertain that both phosphorus and sulphur are within legitimate bounds. Thorough expert assistance is the best protection that both supplier and contractor can possibly have, and the best preventative of anything going wrong in the case of a structure upon which so much depends. But while engineers criticize the effects of competition, we cannot help pointing out that, in certain prominent cases of failure that have occurred abroad, there must have been specifications prepared, and someone must have blundered either in them, or in not seeing that there was due compliance with them. Touching the Ilkeston tank disaster, it is interesting to learn that the above-ground steel tank is now almost the universal system in Germany.

The story as told by Mr. Körting of the difficulty with the local authorities over the Schöneberg gasholder, which deprived the Imperial Continental Gas Association of its use for a length of time, is one of the most singular that we have ever read in connection with gas storage; and it only shows the obtuseness of the lay mind, or its obstinate unreceptivity of world-wide experience, when it aspires to attain an obstructive end. The story is worth reading. But if there is so much trouble from lay quarters over a column-guided holder, we can quite understand how it is that the spiral-guided system is only represented to-day in Germany by a single holder. Technical gas men in Germany are apparently behind in their appreciation of the system, though there has been such considerable experience with it in this and other countries.

Regarding the more technical side of the lecture, there is not much upon which to comment; but the practical hints for the building of large holders to which reference has already been made compress some of the main views of German gas technicians on the subject. We may have a few more points to make upon these in another issue. But in the more general parts of the technical comment in the lecture, Mr. Körting rather criticizes the design of the East Greenwich 12 million cubic feet holder, with its shallow tank. We have not the slightest doubt that, if Sir George Livesey had had the opportunity of designing another gasholder and tank of the capacity of the East Greenwich one, he would not have followed quite the same dimensions; but not for the reason indicated in the lecture. As Mr. Körting points out, the shallower the tank, the less it costs; but the diameter of the holder and the number of lifts must be increased if a large capacity is desired. Such a construction, he adds, is harder to guide than a holder of less diameter and of great height. The East Greenwich gasholder is not the only example of a large holder with a shallow tank. To take one example. The gasholder at Granton (with a working capacity of 6,574,000 cubic feet) has a tank which bears the proportion of 1 inch depth to 7 inches in diameter; while the East Greenwich one was in the proportion of 1 inch to 10 inches. In both cases, economy was the ruling object; and it is certainly questionable whether Mr. Körting has given a sufficient reason for criticizing generally the shallow tank—not so shallow (say) as the East Greenwich one, because, as indicated, Sir George Livesey was not altogether pleased with it himself. In a table that Mr. Körting gives, he shows that the cost of the East Greenwich holder was only 3·72 marks per cubic metre of capacity, which is notable in its lowness compared with the other examples. And as to his point that a shallow lift is much harder to guide than a deeper one of less diameter, Mr. W. R. Herring, the Engineer for the Granton holder, would say that the paramount object of constructing gasholders with shallow lifts is to ensure the level ascending and descending of the inner lift when it is working alone. In this country there has been quite good experience in the guiding of shallow-lift holders. The great trouble experienced with the East Greenwich holder was that while, when the holder was well up there was ample pressure for all

requirements, when only one lift of gas remained, the pressure was insufficient for needs, and the consequence was that part of the stored gas was not available. But by the use of fans, the Company are now, and have been for many years, able to exhaust nearly the whole of the gas in store. We are not quite sure, but it rather looks as though Mr. Körting does not like the flying lifts on the East Greenwich holder—a system also adopted with success in several other holders. If we are correct, then Mr. Körting himself supplies an argument, in his criticism of the antagonism to the Schöneberg gasholder, showing the unsubstantiality of his dislike. He says that "one expert declared that the holder must collapse in any strong wind, "owing to there being no internal horizontal support—forgetting that there would be the pressure of gas inside, "which would be far greater than any possible wind "stresses."

There is only one other point, and that is the consideration of future requirements as to gas storage. In view of the considerable increase in day consumption, and the peremptory claims for gas now made with drops of temperature (which insistent claims will tend to get greater with time, as domestic gaseous heating extends), there is little doubt in Mr. Körting's mind that gas-engineering notions will have to become enlarged respecting the ratio of storage to maximum demand. This is a point to be kept in view in cultivating a more or less seasonal demand, and quantitatively an erratic one.

## Internal Combustion Engine Development.

For several years, Mr. Dugald Clerk, D.Sc., F.R.S., has held the opinion that higher efficiencies in the internal combustion engine can only be attained by the discovery of a new cycle. He is of the same opinion still; but there is no question that the experimental activity on both theoretical and practical lines that the last few years have witnessed has elevated his hope that some further advance will be accomplished. This is satisfactory, as otherwise it would be difficult to place the intrinsic value of the results of the research that has been carried out during the past six years higher than the academical level. There has been an increase of knowledge as to the working fluid, heat losses, and the relations of temperatures to efficiencies; and the expansion of knowledge in these directions has had, and will continue to have, a large bearing upon the future of gas and other internal combustion engines. The review that Mr. Clerk made, in the Gustave Canet lecture before the Institution of Junior Engineers yesterday week, of modern developments of knowledge in connection with the working fluid of internal combustion engines, supplies the foundation for gratification and hope. As, however, the lecture is read, we cannot avoid the view that there is an insufficient comprehension on the part of those who are associated with the use of the gas-engine as a means to a commercial end, and therefore who must be concerned in the realization of maximum efficiencies, of the indebtedness which they are under to the British Association Committee of physicists, chemists, and engineers who have been especially studying these matters, and who have done so much, and hope to do more, in establishing order out of the varied theoretical beliefs formerly entertained, while simultaneously extending the limits of exact knowledge. We have only to read the extracts from the long lecture as published in other columns to realize—even then indifferently—the mass of close work that has had to be done by skilled scientific experimenters, to achieve the results that are freely at disposal for the guidance of investigators and practice. This is the principal value of the work, inasmuch as, while the old cycles of operation continue, there seems little chance of increasing the efficiencies already attained. The indications of investigations and revised theory cannot fail to have value in obviating the pursuit of unprofitable lines of work, in directing to new ones, assisting in the prevention of working troubles, aiding engine control, helping to constructional economy, and suggesting mechanical improvements. The smallest economies cannot be rejected to-day, in view of steam-turbine efficiencies. Therefore, the more exact knowledge of heat losses and of the properties of the working fluid that modern investigation has given is highly important. Reviewing this work and its results, a good depth of directive meaning can be attached to the closing words in Mr. Clerk's lecture: "It is to be hoped that new cycles will "be discovered, and that the high thermal efficiencies "possible by internal combustion may be combined with the "great mechanical advantages of the rotary turbine in some "manner which will enable the large gas-engine to rival the "steam-turbine fully in mechanical power and dimensions, "as it at present more than rivals it in economy and thermal "efficiency."

## Queer Treatment from Chesterfield.

Only the other week—May 27—we were pointing out the hardship which candidates for appointments have to suffer through the condition as to the supply of testimonials upon making initial application for vacant positions. A peculiarly hard case in confirmation comes before us in a letter from Mr. Albert R. Cawley, which appears to-day in our "Correspondence" columns; and (unless there is another complexion to put upon the story, for which, however, we cannot see an opening as the facts are presented to us) the illustration does not redound to the credit of the Chesterfield Gas and Water Board. The facts are simply these: The Board invited applications for the position of General Manager, and required no less than twenty *printed* sets of application and testimonials, in stamped, unaddressed envelopes, for posting from the Clerk's office to the individual members of the Board. Among the applicants was Mr. Cawley; and, to comply with the condition, he had to expend £2 10s. on the printing of his application and testimonials (including ten copies for reserve). This is a heavy tax for one candidate; and probably there were several who had to bear a somewhat similar outlay. Formal application was made by Mr. Cawley on April 10; and three months, or thereabouts, later [July 3], he received back the parcel of applications and testimonials just as he had forwarded them, accompanied by the following (under the circumstances) very curt letter: "I am directed to return the testimonials which "accompanied your application, and to add that the question of the appointment is for the present in abeyance." Not a word of apology for the trouble, inconvenience, and expense to which applicants had been put; nor even the courtesy of a signature to the carbon copy of the letter accompanying the printed matter on returning from its fruitless and useless journey. The envelopes in which the sets of application and testimonials were enclosed had not been addressed to members of the Board, nor had the stamps been cancelled; so that the members had not seen, and so had not perused, what they themselves had asked for. Therefore all this trouble and expense on the part of candidates had gone for nothing. Well may our correspondent, in righteous indignation, say: "All the applicants have been "fooled." It is about as sorry a piece of business in this line as we have met with; and the least that should have been done (whatever may be the cause of the "abeyance" of "the question of the appointment") would have been to apologize to the candidates, and to offer to defray the expense to which the Board had, by their conditions, put them individually. This would at any rate have been (altogether apart from disappointment) evidence of a desire to act decently under the circumstances. But the method of dealing with the matter does not appeal to us as an example of either good taste or fair treatment.

## The Increase in Railway Rates.

Manufacturers and traders are more than ever keenly incensed over the increase by 4 per cent. from the 1st inst. of rates on merchandise on the English railways, and of advances by the Scottish lines on coal and coke. The mineral rates on the English lines are not yet under notice of increase, probably owing (the "Iron and Coal Trades Review" suggests) to the fact that in 1908 the companies secured an advance of 2½ per cent. on the bulk of this class of traffic by reducing the railway ton of coal from 20½ to 20 cwt. Chambers of Commerce and the Mansion House Association on Railway and Canal Rates are busy; and the Railway and Canal Commissioners are likely to have a very active time in hearing appeals against the new impost, which has resulted from the Act authorizing the companies to compensate themselves from the rates on goods traffic for increases of wages and other costs having relation to the improved conditions of the railway workers. It is obviously unfair (but the Legislature has approved it) that the whole of the increase should be placed upon the country's industries, some of which will have to bear the increase of rates twice, by paying

on both raw and manufactured materials. One hardship under which traders labour in this matter is that there are no statistical means available by which they can judge as to the fairness of any proposed increase, or by which they can prepare a case in opposition, before appealing to the Commissioners. They are working absolutely in the dark, as the railway companies will not afford them any facilities whatever for investigation. Under the circumstances, there are no means by which they can ascertain, before incurring considerable expense, whether 1, 2, 3, or 4 per cent. increase in rates is justified. Therefore, the only thing to be done is to indulge, without cognizance of whether they are doing right or wrong, in expensive fighting. The inequality in the respective positions of the parties to an appeal, and the situation generally in which the traders find themselves, are absurd. The latter have the right of appeal; but no right to command any disclosure to enable them to prepare for it. This is a matter that should not be left where it is.

## From Coal to Gaseous Heating.

The presidential chair of the Waverley Association was occupied last Friday by Mr. Thomas Black, who is in charge of the Coldstream Gas-Works. Coldstream may not be a large, nor rapidly growing, place; but among its ancient rights is the claim to being one of the pioneers in gas supply in Scotland. Though the town is small, and though the price of gas is necessarily high, the Directors of the Gas Company and Mr. Black, have, during the past three or four years, been demonstrating that, under the adverse conditions with which they have to deal, it is possible to make a big development in business by going the right way to work. It is a great pity that, just when the country was ripe for not only the maintenance but the speeding-up of the march of the gas industry in taking possession of larger tracts of the heating field, the price of coal should have increased and the price of coke should have weakened. But nevertheless, so far as prosperity in gas consumption goes, there is nothing of which to complain at the present time. So strongly marked indeed are the signs of the times that (we gather from his address) Mr. Black believes that in the near future the use of coal in the average house will be the exception rather than the rule, especially in populous centres.

## Strong Faith and Fitness.

The faith is strong within Mr. Black; but the gas industry is not going to have a walk-over without resistance on the part of the coal merchants. But it is not the gas industry's business to study them. The advance of civilization, social betterment, and economic utilization of our principal raw material cannot be arrested in order that individual interests may be served. "The solution of the smoke nuisance lies in the hands of the gas industry." In this we sincerely believe Mr. Black is right; but it rests with the gas industry to do its part in making known its own capacity for service. The appliances of the gas industry are now high class in efficiency; but, as Mr. Black says, every gas undertaking should make it part of its duty to have periodically an inspection of the gas appliances on the consumers' premises. The initial efficiency must be the continuing efficiency, and this cannot be, and will not be, without occasional expert supervision. There is advocacy in the address of pressing into the domestic service not only the large appliances, but the small ones—such as gas-irons. If builders would only fully realize the assistance gas undertakings can be to them and the tenants of the houses they erect, through the gas-cooker, the circulating water-heater, and other appliances, they could save the money expended on the present customary, and little-used, coal range, and provide the accommodation for gas appliances. Another point made in the presidential utterances is the need, to obtain complete combustion of the rich Scotch gases, of higher pressures in order to induce a greater air supply in bunsen burners.

## The Nitrate Half Year.

The usual half-yearly reports on nitrate of soda will perhaps be perused by those interested with special interest on the present occasion, owing to early hopes, which have not been fully realized. It seems, from one of these documents (that issued by Mr. Thomson Aikman, jun.) that the acreage devoted to beet sugar cultivation is estimated at about 4 per cent. less than last year, as a result of the substantially lower prices ruling. While nitrate of soda has shown a decrease in deliveries for the six months to June of about 1¾ per cent. as compared with the corresponding period of 1912, the average realized price has been 7d. per cwt. higher. On the other hand, the production of sulphate of ammonia is, he says, believed to have increased by about 5 per cent. with an average decrease in price of about 9d. per cwt. There falls to be recorded some increase in the supply of atmospheric nitrogen; but the view is expressed that it appears improbable that the production of this article can sufficiently increase to make it a serious competitor with nitrate of soda and sulphate of ammonia for some years to come. Discussing the causes of the disappointment experienced in connection with the nitrate of soda market, Messrs. Montgomery and Co. remark that perhaps the primary reason may be attributed to the fact that the volume of nitrate which would have made heavier deliveries was not forthcoming until the season was well advanced, though even then the excess stock of to-day, had it been available, would not have made good by a long way the reduction for the six months of 117,000 tons. As a result of the state of affairs anticipated if the present rate of production continues, it appears, a scheme originating in Chili for the curtailment of output by about 100,000 tons for the six months to December next has been considered at a meeting of English producers, and has been well received. Even without restriction, however, the opinion of the firm is that Europe will be able to absorb the extra quantity.

## Consumption and Prices.

The consumption of nitrate of soda in Europe for the past six months, Messrs. Montgomery state, was 1,331,000 tons, against 1,448,000 tons in 1912, or a decrease of 8·08 per cent. America, on the other hand, comes well to the front with a substantial increase; while for countries outside Europe and America a slight falling off is recorded. Stocks in Europe are some 25,000 tons more; and the quantity afloat is also considerably more. The total visible supply for Europe amounts to 405,000 tons, against 318,000 tons a year ago, thus giving an increase of no less that 87,000 tons. The course of prices in the past six months, it is pointed out, shows a fluctuation of about 40s. per ton for due or arrived sailing cargoes, and of about 17s. 6d. per ton for free on board nitrate in Chili for prompt shipment; the highest and the lowest for the former being 11s. 4d. and 9s. 4½d. per cwt., cost and freight, while the latter ranged from 8s. 5d. to 7s. 6d. per quintal. Throughout June, the market ruled weak; and the prices reached were about the lowest of those just quoted. A general survey of the situation, leads the firm to the conclusion that, the consumption being much more likely to increase than to diminish, the outlook for nitrate producers seems to be very favourable for some time to come.

## Electricity in Purifier-Houses.

As naked lights are not conducive to safety in purifier-houses, where there may be escapes of gas when material-changing operations are in progress, electric lights are sometimes used; and with fell consequences in certain instances, where flexible wiring has been employed, and abrasion of the insulation has occurred. The propelling by electrical energy of mechanical arrangements for moving the lids of purifier-boxes has also followed the introduction of electrical driving of travelling retort-house machinery. But considerable care should be exercised in incorporating electric driving in purifier-house equipment. The Chief Electrical Inspector of Factories (Mr. G. Scott Ram), in his annual report, calls attention to a fatal accident that has occurred through this. In a purifier-house at one gas-works, an electrically driven crane was used for lifting the lids of the boxes; and evidently sparking caused by the sliding contact on bare trolley wires was the cause of an explosion, and the killing of a man. This is how the report describes the occurrence: "Although the motor and controller were specially constructed to be gas-tight, ordinary collectors with sliding contact on bare trolley wires were used. A lid of the purifier had just been lifted, and was being traversed across the purifier-house, when a 'cloud' of gas from the purifier was ignited. The crane driver in the cabin of the crane was killed by the burns he received from the ignited gas."

## Central Lamp Standards.

On the eve of the recent third International Road Congress the Roads Improvement Association held their first conference and among the items presented on the occasion was a paper by

Messrs. E. S. Shrapnell-Smith and Wallace E. Riche, treating of the organization and work of the branches of the Association. In the course of the communication, they urge the abolition of central standards in roadways; and this is a point that cannot be too strongly impressed on road authorities, except, of course, in the case of roads of extraordinary width in relation to the traffic they have to accommodate. Generally speaking, the erection of standards, for tramways or lighting, also of public conveniences and other obstructions in the centre of the road, or so near to the kerb as to impede the free passage of road vehicles, is frequently a grave source of congestion and of danger to the public. These reduce the traffic capacity of the streets, in the case of central standards, by at least 30 per cent. Some years ago the Roads Improvement Association succeeded in impressing this fact upon the Board of Trade (Tramways and Light Railways Department); and the Board promised not to sanction the erection of any more central standards for tramway purposes, unless unavoidable. Very few have been erected since that date; and the branches of the Association are advised to utilize any available opportunity to persuade authorities to take down those now in existence, and re-erect them at the side of the road.

## PERSONAL.

Mr. H. G. W. Timbrell, who has been for fourteen years in the Accountant's Department of the Isle of Thanet Gas Company, has left to take an appointment with a firm of Chartered Accountants in London. The Secretary of the Company (Mr. T. C. Fuller) recently presented him, on behalf of the officials, with a parting gift in the shape of a suit-case.

Mr. A. C. Taylor has been appointed Distribution Engineer to the Colombo Gas and Water Company. Mr. Taylor was educated at the Royal Grammar School and Storey Institute, Lancaster, and served his articles under Mr. C. Rhodes Armitage, the Gas Engineer of the Morecambe Corporation, to whom he has been assistant since the expiration of his articles.

Last Friday, Mr. W. J. Pickering, the Chief Assistant at the Central Laboratory at the Nechells Gas-Works, Birmingham, was presented with a set of cutlery on the occasion of his marriage. Mr. E. W. Smith, M.Sc. (the Chief Chemist), in making the presentation on behalf of the chemical staff, referred to Mr. Pickering's sterling honesty of character, and to the valuable service he had rendered to the Gas Department during his eight years of service. Several members of the staff spoke in complimentary terms of Mr. Pickering's ability and personality, and expressed their best wishes for him in his married life.

The vacancy caused by the death of Mr. Arthur Graham, for many years Gas and Water Engineer to the Mansfield Corporation, has been filled by the appointment of Mr. William James Rendell-Baker, who for the last nine years has been the Gas and Electricity Engineer to the Malvern Urban District Council. There were a considerable number of applicants for the position; and five were interviewed by the Council at a special meeting held last Thursday evening. The successful candidate is thirty-six years of age, is a member of the Institution of Gas Engineers, Vice-President of the Midland Association of Gas Managers, and an associate member of the Institution of Electrical Engineers.

## OBITUARY.

### JOHN ARMITAGE DRAKE.

News will be received with regret throughout the gas industry of the death last Friday morning, at the age of sixty-two, of Mr. John Armitage Drake, J.P., of Heath Lodge, Halifax, head of the firm of Drakes Limited, of Halifax. Some five weeks ago, while on business in the United States, Mr. Drake was taken seriously ill; and on the voyage home he was under the care of a steward of the liner. After his return, he was confined to bed, suffering from internal trouble; and little hope was from the first entertained of his recovery.

The firm of Drakes Limited was founded by the late Mr. Jonas Drake, the father of the deceased, more than fifty years ago, and in its wonderful development Mr. Armitage Drake took a prominent part. He was a shrewd, capable, business man, particular in every detail, and anxious that everything turned out under his name should be of the very best workmanship. In this way, the firm's reputation, not only in this country but in other lands, quickly spread; and Mr. Drake had a remarkable record of foreign business tours. From a small beginning, the business rapidly extended; and twenty-three years ago the works were transferred to Ovenden. On this site extensions have been made from time to time, until now the works assume huge dimensions. Twelve years ago, the firm was converted into a limited liability company, with Mr. Drake as Chairman—a position that he filled with credit until his death. His relations with the employees, numbering about 700, were always of the happiest character. He was held in the highest esteem, for his fairness and considerateness, and was looked upon as a model employer. Last year, on the occasion of the opening of the new power plant at the works, he was presented with a rose-bowl from his co-Directors as a token of esteem. His two sons—Mr. William Armitage Drake and Mr. J. Wilfrid Drake—have both been trained in the business, in which they have for some years taken a responsible part.

In the religious, social, commercial, and political life of Halifax Mr. Drake always took a deep interest. In 1906, he was placed on the Commission of the Peace for the borough. He was a member of the Chamber of Commerce; and in 1901 he was elected unopposed to the Halifax Town Council, where his expert knowledge was desired to assist in placing the gas undertaking on a sound basis. As a member of the Gas Committee, he devoted himself unsparingly, and with complete success, to assist in carrying out the work the ratepayers had given him to do. Having accomplished this, he relinquished public work two years later in order again to devote the whole of his time to business. Mr. Drake was a Vice-President of the Halifax Trade Protection Society—a position he had held for twelve years. He was also a member of the Council of the Association of Trade Protection Societies of Great Britain; and here, as in every other branch of activity, he won the esteem of all who had been brought in touch with him. He was a member of the Society of British Gas Industries, and was Chairman of the Retort-Setting Section. The large works at Ovenden were visited a few weeks ago by the members of the Yorkshire Junior Gas Association.

In Freemasonary, the late Mr. Drake was a prominent figure. Besides being a Past-Master of the Acacia Lodge (Bradford) and one of the founders of the Ionic Lodge (Bradford), he had received provincial honours, for at one time he held the office of Provincial Grand Superintendent of Works of the West Yorkshire Province.

Mr. Drake leaves a widow, for whom and the two sons already named the deepest sympathy is felt. Reference to the loss the town had sustained was made by the Mayor at the Borough Police Court on Friday.

The interment took place yesterday, at All Saints' Church, Salterhobble.

## The Kaiser a Doctor of Engineering.

On the occasion of the celebration of the 25 years Jubilee of his reign, on the 16th ult., the Emperor of Germany received a deputation of Rectors of all the Technical Colleges of the German Empire, who unanimously asked him—through the Rector of the Technical College of Hanover as spokesman—to accept the honorary degree of "Doctor of Engineering" in recognition of the distinguished services which he had in the course of his reign rendered to technical science and the structural arts. The Kaiser, in accepting the degree, spoke in high appreciation of the assistance which the Technical Colleges had given in developing the resources of the Empire.

## The Staff Changes at the Croydon Gas-Works.

The number of the "Croydon Co-Partner" for the present quarter opens appropriately with an "Editorial Note" on the retirement of Mr. James W. Helps and the staff changes consequent thereon. It was as follows: "The one outstanding recent event in connection with the Company has been the necessity which Mr. Helps has felt himself under, owing to his recent uncertain state of health, of relinquishing his official connection with the Company. We are glad to believe that this severance, though official, will not be a personal one. Mr. Helps is continuing to reside in Croydon, and will, we feel sure, not wish to loosen the ties of personal affection which have for so many years existed between himself and those who have been proud to work under him. It is not, however, easy to realize the loss which the workmen and staff will suffer, as also the Company whose affairs he has guided for nearly a generation with such conspicuous ability and success. His retirement necessitated provision being made by the Directors for carrying on the technical work of the Company both as to manufacture and distribution. Our readers will join with us in tendering congratulations to Mr. Caddick, who assumes responsibility for the manufacturing side of our business with the position of Engineer and Works Manager; and to Mr. Sandeman, who, as Distributing Engineer and Sales Manager, will henceforward control the Distribution Department. This arrangement ensures a continuity of the conditions under which the Company's business has, in effect, been carried on for the greater part of two years past; and the promotions will be recognized as but the well-merited reward of good service rendered to the Company."

**East Hull Dessau Results.**—It will be recollected that, at the recent meeting of the North of England Gas Managers' Association, the results of the working of the Dessau retorts at East Hull were under consideration [see "Journal," May 6, p. 404]. Since then, between June 6 and 20, 654 tons of coal were carbonized; and the average yield of gas was 15,144 cubic feet per ton. The candles per ton were 44,286, and the B.Th.U. 8,162,616. These figures are equal to rather more than 14-candle power gas, and 539 B.Th.U. per cubic foot. We do not know the coal used; but we think it may be taken that the results include two hours' steaming, and that the B.Th.U. are gross.

## NOTES FROM WESTMINSTER.

MOVEMENT is being made, with long strides, with Private Bills at Westminster; and there is quite a goodly batch of measures awaiting the formality of Royal Assent. Several further measures have passed before the Unopposed Bills Committee of the Commons; and in the House of Lords the Tottenham and Edmonton Gas Company's Bill at the end of the week was, with many others, ready for third reading. Among the Bills that have been before the Unopposed Bills Committee of the Commons is the United District Gas Bill, which is another of those measures that are wiping out some of the ill of City Company promoters who were, in recent years, busy operating on the fair fame of the gas industry. Incorporated in the proposals of the Bill is one authorizing occupation of two or three areas in possession of the Banbury Gas Company, but which have not yet been supplied by them. The proposal caused the Banbury Company to show fight; but they compromised with the promoters by accepting a solatium in the shape of a contract for the supply of gas in bulk to the new Company for the three districts, for ten years, at the price of 2s. per 1000 cubic feet.

**Gas Companies as Electricity Competitors.**

The Tottenham and Edmonton Gas Bill now only awaits final endorsement; for all the stages in parliamentary procedure at which opposition can be offered with a chance of effective result have been passed. The Enfield Gas Company will therefore in due season cease to exist; the rights of electricity supply in Wood Green will pass into the hands of the Gas Company; and, before long, the Tottenham Company will be known as a "Light, Heat, and Power Company." The North Metropolitan Electric Power Supply Company lost no chance in trying to prevent the Tottenham Gas Company securing the transfer of the Wood Green District Council Electricity Provisional Order, and the power to negotiate for the transfer of Orders in the possession of other authorized suppliers. But they have been beaten all along the parliamentary course. They had opportunity for years to compromise with the Council for a transfer of the Order; for negotiations seem to have been proceeding between the Council and the Power Company since 1906. But they were never able to meet the Council in the same way that the Gas Company have done. When the Bill came before Lord Newton's Committee last week, Mr. Honoratus Lloyd, K.C., on behalf of the Gas Company, successfully opposed the *locus* of the Electric Power Company, notwithstanding the argument by Mr. Balfour Browne, K.C., for the latter. The ground of the Power Company's appeal to be allowed *locus* was that a new form of competition would be introduced if the Gas Company were given powers of electricity supply; but no one explained, in transparent terms, how the exercise of the powers by the Gas Company instead of the District Council would create new competition. The Power Company have already rights of bulk and power supply, with 25 per cent. of the consumption by power consumers being used for lighting; and no one proposes to interfere with these rights. The Power Company, however, have never been able to successfully compete with the private generating plants driven by the Gas Company's engines. The only way in which they could possibly have defended their submission that the competition was new would have been by urging that the Gas Company's competition would be more effective than that of the District Council. But the Power Company could hardly bring themselves to make open confession of that which they may feel inwardly. In this case we have Mr. Balfour Browne suggesting that it is anomalous to give electricity powers to gas companies. We have often heard Mr. Balfour Browne dilate on public policy, public expediency, and public economy; and learned Counsel may be respectfully advised to study this matter of electricity supply by gas companies from these points of view. If he cannot find something that is expedient and economical, for public and shareholders alike, in placing in certain districts the supplies of both gas and electricity in the hands of one company, we shall be very surprised. Electricity supply powers were granted to the Ascot and Brixham Gas Companies in 1906; to the Aldershot and Yorktown Gas Companies in 1909; to the Farnham and Bishop's Stortford Companies in 1910; to Bangor in 1912; and to Herne Bay, Westgate and Birchington, and Cromer this session. Now we may with confidence add the Tottenham and Edmonton Company.

**New Competition and "Locus."**

As we have seen, the Power Company in the Tottenham case argued, through Mr. Balfour Browne, that new competition would be set up by conferring upon the Gas Company electricity powers in respect of Wood Green; and therefore it was contended by learned Counsel that they were entitled to *locus*. In the case of the Middlesbrough Provisional Order Confirmation Bill, which contemplates an extension of boundaries calling for opposition on the part of the South Bank and Normanby and the North Ormesby Gas Companies, Mr. Balfour Browne appearing for the Corporation, had to offer resistance to the application for *locus* on the part of the Companies. In doing so, he declared that "the whole position was that the proposed extension of Middlesbrough would leave the legal rights exactly as they were at present, and nobody was entitled to *locus* unless it could be shown that there was something in the scheme to affect their legal rights." The Power Company in the case of the Tottenham Bill could not show anything that was likely to affect their present legal rights; the two Gas Companies, in the case of the Middlesbrough measure, could show that new conditions would arise through its passing that would be detrimental to themselves and to their rights, and so they obtained *locus*. The story is simply this: Middlesbrough have gas-supply rights in the areas of the two Companies; but they have never exercised them, and they could not exercise them without obtaining power to lay mains through the Ormesby Council's area. The two Gas Companies have been serving the districts. The proviso to the Middlesbrough powers as to obtaining the consent of the Ormesby Council has been a protection not only to the Ormesby Company but also to the South Bank and Normanby Company—Ormesby being a "buffer state" between Middlesbrough and the district of the latter Company. Supposing Middlesbrough obtain the extension of their boundaries, they would then be able to grant themselves the right to lay gas-mains in the two areas, and compete with the two companies, and be, it is perfectly obvious, in a far better position for effective competition with them. They would simply be able, if they so chose, to drive to the wall, by force of superior position, the two concerns that have been supplying these areas. The Court of Referees considered the extension scheme was exposing the two Companies to circumstances which created new competition, and so, very properly we think, granted them *locus*. We hope that the Companies will obtain protection, or that some arrangement will be come to that will be satisfactory both to them and to the Corporation.

**Hove Electricity Purchase.**

It will be remembered that, when the question of the purchase by the Hove Corporation of the local electricity concern was being debated, the Municipal promoters of the scheme decided that they would apply to Parliament, and not to the Local Government Board, for the necessary powers, on the ground that the former would give them a longer loan-repayment period than the latter. It was pointed out in these columns at the time that the ideas of Parliament, as well as of the Local Government Board, were shrinking in regard to loan-repayment periods. The Corporation made their calculations on a period of forty years for the purchase loan, notwithstanding that part of the plant has had a working existence of something like twenty years. Since then they reduced their ideas to thirty years for the purchase loan, and twenty years for money spent on extensions. In view of the age of some of the plant, the Local Government Board considered 21 years would be sufficient. When the Bill came before a Commons Committee the other day, the modified periods proposed by the Corporation were considered legitimate ones under the circumstances; and so they were agreed to. But the thirty years is a 25 per cent. reduction from the original views of the Corporation. There is another point about this municipalizing of the concern. We hear much in these days as to ratepayers being part proprietors in such municipal trading concerns. When the poll was taken at Hove on the question of transfer, only 1384 ratepayers expressed themselves in favour, and 1015 against—giving a majority in favour of only 369. But there were 6300 ratepayers who did not vote; so that there were 7315 who either voted against, or did not express any opinion at all. Through the 1384 ratepayers who pronounced a favourable opinion, the 1015 who were opposed, and the 6300 who did not vote, are to have municipal trading in electricity supply forced upon them; and they will in time be described as part proprietors in the concern, however unwilling they may have been to become so, or however unwilling to have anything to do with the matter, one way or the other.

## ELECTRICITY SUPPLY MEMORANDA.

THE report of the Council of the Incorporated Municipal Electrical Association shows that that body and the ordinary members have their eyes wide open to passing and developing events. There is

**Competition and the Bill.**

reference in it to the unhappy Bill the Association have promoted in Parliament; and that is not the only measure to which the eyes of the Council have been turned. It has been noted that gas companies are seeking power to supply electricity; and, through the Information Bureau of the Association, the Council have expressed their views on this action. The nature of these views is kept hidden from the gaze of those who would be remarkably interested in knowing what the municipal representatives think of those gas companies who, seeing economy in this movement for both community and themselves, are taking action wherever any opportunity offers. The municipal electricity suppliers do not like this any more than they like the gas companies showing large electricity consumers how they can obtain electrical energy for all purposes at a lower average price than from the ordinary electricity suppliers. But what reasonable objection they could advance against a community getting anything that is required in the most economical way, it is difficult to imagine; and the report before us is silent on the subject, and so does not enlighten us. About the Association's Bill, the Council seem to be getting a little fatigued over its ill-fortune. They have

tried to whip-up the municipalities to lend them a hand in bringing parliamentary representatives up to the scratch to gain for the Bill a better place; but there appears to be an almost general listlessness over the measure. Perhaps municipalities and members of Parliament realize that there are so many matters in it that are altogether opposed to parliamentary precedent and usage that there is little chance of getting anything more than a very emaciated representation of the original through. However, the immediate result is that the Council of the Association have quite made up their minds that the introduction of the measure this session has no more value than the certification so given that it is not dead, but sleeping. They hope for better luck next year. In fact they profess to be very hopeful; for they say that effective work has been accomplished in reconciling the conflicting interests of promoters and opponents of the Bill. Among other anticipated good things is that, if the Bill passes in its present form, it will give greater scope in the matter of publicity finance.

**Ratepayers as Proprietors.**

It is some time now since we have had specially brought to our notice literature issued by electricity undertakings that contain false and slanderous statements regarding competing gas supply. There has in some quarters been a permanent cessation of this sort of thing on a threat of litigation, and on a shifting of the cloud of ignorance that obscures knowledge that legal opinion is that, where it can be proved that false representations deliberately inserted in trading literature of the kind has had the effect of causing trade injury to a competitor, an action for damages will lie. We have just been perusing a pamphlet signed by Mr. H. P. Stokes, the Electrical Engineer and Manager of the Bexley District Council's Electricity Department; and there are certain statements in it for which we desire to ask Mr. Stokes for proof. If he has any courage, and is not possessed by the weakness of many other electrical engineers whom we have had occasion to challenge, he will reply, or endeavour to reply, categorically to our inquiries. Before putting our interrogations, a point has arrested attention in connection with which Mr. Stokes puts a very childish question to the recipient of his pamphlet. He asks the recipient whether he thinks he is justified in patronizing a competitive concern when his own Council have an undertaking in which he, as a ratepayer, is part proprietor. We should like to know how many of the ratepayers of Bexley can stretch their imagination to the extent necessary to produce the feeling of part proprietorship in the electricity supply concern. The ratepayers, as such, had precious little to do with the bringing into existence of the electricity undertaking. Among the ratepayers of Bexley are the Gas Company and the shareholders of the Company; and, therefore, how is it the Council allow one of their officials to deliberately exceed legitimate methods of competition in order to do an injury to these ratepayers?

**Cost Questions.**

The next point that invites consideration is one that the supply of electrical energy in the district is given at rates that are more favourable than those for gas. At Bexley Heath a tariff has been adopted of 2s. 6d. in the pound on the rateable value, *plus* 1½d. per unit of electricity consumed. Supposing a house of £40 rateable value, and supposing a consumption of 266 units a year. The 2s. 6d. per £1 of rateable value and the 1½d. per unit would make up an account of £6 13s., which would be equal to 6d. per unit. Let us take it that 6d. will buy 125 cubic feet of gas in Bexley Heath. This quantity of gas will represent for lighting, with the modern inverted gas-burner, 2500 candle-hours, as compared with (say) 800 candle-hours for the unit of electricity. The 125 cubic feet also represent upwards of 62,500 B.Th.U.; the unit of electricity 3420 B.Th.U. (or if Mr. Stokes prefers it 3440 B.Th.U.). An explanation as to how Mr. Stokes came to state that the rates for electrical energy are more favourable than those for gas will interest us. In the next place, it is noticed there is a statement that the Council are prepared to make arrangements with any prospective consumer for the wiring of his premises, so that the cost may be spread over a term of one to seven years to suit the requirements of the consumers. The Council may have the power to do this; but it would be as well to see whether or not they are acting *ultra vires*. In an extremely slipshod manner, reference is made in the pamphlet to the cost of fitting-up houses. It is said that it is possible to do all the electric fitting for an ordinary house for £5 or £6. Of course, it is possible to do all sorts of things after a fashion on a little expenditure; whether it is advisable, is totally another matter. There is no information as to what is an "ordinary house," or how many lighting points are included, whether the indication as to cost embraces wiring, the supply of fittings and lamps, and the globes and shades that are necessary for protecting the sight from injury by the "hard glare" of naked electric lamps—a "hard glare" due to high intrinsic brilliancy. Touching this point, too, Mr. Stokes asserts that the light given by electric lamps approximates much more nearly to daylight than any other artificial illuminant. Will Mr. Stokes kindly supply his authority for this, and show us the spectrum of any electric light that approximates nearer to daylight than the spectrum of gaslight? It seems to us, too, that Mr. Stokes has made a little concession to his conscience in using the expression "should have" in referring to an average life of 1500 hours for metallic filament lamps. Recent published experiments at the National Physical Laboratory [see "Memoranda" in the "JOURNAL" for June 3] do not accord an average life of anything like 1500 hours. "Average life" should include all lamps purchased by a user; and many lamps there are that meet with a premature end, owing to brittleness, and increasing brittleness with age, of the filaments.

**"Slow Poison."**

We have not done yet with Mr. Stokes and his pamphlet; and what we have to say now deals with what we regard as the most scandalous part of the production. Men of science who have particularly studied this matter—men against whom Mr. Stokes would cut a pitiable figure in regard to knowledge on this question—have shown that what is necessary in rooms inhabited by human beings is change of air—air in motion, and not stagnant air. Mr. Stokes tells the people of Bexley Heath that to produce gaslight at all a "plentiful supply" of air is necessary. We are not aware of what he means by a "plentiful supply;" but in all ordinary rooms, so long as there is a sufficiency of air for the support of combustion of any kind, there is more than is necessary for human beings. Moreover, a gas-burner only requires a small fraction of the air necessary for a coal-fire, and the domestic hearth has been in existence for ages, and the population has not in consequence diminished. But because of the presence of gaslight, this electrical engineer tells the householders of Bexley Heath that "a continual current of air" must pass through their rooms. And why not? Need the beneficial current of air be greater than is necessary for sanitary conditions where human respiration is going on? If it is essential to insult the intelligence of people in order to try to obtain business for an electrical concern, then the electrical industry must be hard put to it. But the most serious point is conveyed in this insidious question: "Has it ever occurred to you that, by using gas, if you do not leave ample capacity for the circulation of air, you are adopting a system of *slow poison*." We ask Mr. Stokes to give us a proper explanation as to what he means by a "slow poison," used in this connection. It is obvious that the statement has been put into the pamphlet in the form mentioned with the deliberate intention of attempting to frighten people, and to turn them from the use of gas to electricity. It is in itself, and in its intention, a slanderous statement; and members of the Bexley District Council ought to be thoroughly ashamed of themselves for allowing it to be circulated under their auspices. If we were the gas company operating in the district, we should immediately take steps to compel the withdrawal of a pamphlet containing such an assertion, for it bears an untrue significance that is meant (and deliberately so) to damage the business and interests of a concern working under statutory authority. A further falsehood in the pamphlet is that electricity needs "no precautions," because the user is absolutely free from any risk due to fire or explosion. Will Mr. Stokes tell us why there are on record many fires that have been proved to be due to electricity?

**Electric Cooking.**

A little information from Mr. Stokes would also be useful upon the question of cooking and heating. He includes in the pamphlet a table showing extraordinary losses in weight of meat when cooked in a gas or coal heated oven compared with when cooked in an electric-oven. A point upon which we have sought information from electricians, and have never obtained it, is why, when using the same temperatures, and cooking similar joints to the same degree in both cases, there should be more shrinkage of a joint in a gas-oven than in an electric one? Mr. Stokes has fathered a definite statement; perhaps he will reply to the question. At the same time he might endeavour to justify the statement that the table shows "exactly the economy effected when cooking by a 'Tricity' cooker over that of either coal or gas." All joints are not alike, all cooks are not alike, all temperatures used are not alike, all human preferences in regard to the cooking of food are not alike. How then can the table show "exactly the economy" to be effected under the diverse conditions operating in kitchens? But why does Mr. Stokes confine himself to the inside of the oven, when something like 75 per cent. of the cooking operations, including water heating, are done outside the oven—on top or extension plates? Is it because electricity shows up so badly in comparison with other heating agents? Only last week, we reported (p. 62) that the tenants on the Latchmere and Town Hall Estates had petitioned the Battersea Borough Council to arrange with the Gas Company to let them have the benefit of gas-cooking stoves. These estates had been preserved as happy hunting-grounds for the Electricity Department; but the tenants have had such experience that they will not have imposed on them the difficulties and expenses of electric cooking—preferring the economy, reliability, and greater range of service of the gas-cooker.

**Water Heating.**

There are other minor matters bearing upon this question of electric cooking that we should like to refer to, but already the pamphlet has made large claims upon our space. In regard to the heating of water for bath purposes, however, we should like to be informed by Mr. Stokes. He tells his readers that, starting from cold, a bath of hot water can be available in thirty minutes, at the cost of 1d.—that is, by using the "Torpedo" electric-heater. If 1½d. per unit is the price charged for heating, *plus* the proportion of the fixed charge on the rateable value of the house, the penny represents less than two-thirds of a unit of electricity; and a full two-thirds of a unit is only equal to

2280 B.Th.U. In view of this, we should be pleased to learn how much hot water Mr. Stokes proposes for the bath, and what is to be the temperature of the water? An advertisement in the pamphlet shows that the one-gallon size of the "Torpedo" heater costs £2, and the 4-gallon size £4 10s. For a good bath for an adult person one requires 25 to 30 gallons of hot water! While on this subject, we find this statement:

> Don't risk your own life, and the lives of your family by having dangerous gas-heaters [? water-heaters] in your bath-room. bear in mind the awful fatality which occurred only a few weeks ago, due to a gas-heater in a bath-room, whereby several lives were lost.

We quite agree that it is silly to have "dangerous" water-heaters in a bath-room; but all gas-heaters are not dangerous. Let us ask Mr. Stokes, and the Bexley District Council, whether the South Suburban Gas Company have ever been known to recommend the fixing of a "dangerous" gas-geyser—that is to say, an unventilated one? There is no piece of gas apparatus (into which cold water is constantly entering, and flames are playing on the metal) over which a gas company exercises more care; and when simple care is exercised, the gas water-heaters are as free from danger as a coal fire. If the South Suburban Company did not exercise that care, then the reference to the fatality in question would be justified; if they do, then there is a scandalous misuse in the pamphlet of that lamentable occurrence, which was due to gross ignorance. Upon this criticism of the pamphlet, we ask Mr. Stokes and the Bexley District Council whether they are proud of the production, and of the unfair attack made through it upon the business of a competitor? Our columns are open to Mr. Stokes for his justification; and we hope he will have the courage to deal with the matters in a frank manner. In competition, we do not mind making use of all argument that can be justified; to go beyond that is mean and unworthy of men.

**Coal Merchants and Gas-Fires.**

"Meteor" of the "Electrical Times" is quite delighted with the circular recently issued by the coal merchants in connection with their crusade against gas heating. The circular was criticized in our editorial columns, June 17. We see that "Meteor" states that "the gas people are between two fires—the electric and the coal; and their position will become uncomfortably warm as time goes on." In a sense, both statements are true. The gas-fire is between the two inefficients. In its rear is the electric radiator, which it is busy supplanting, and giving further set-back to. In front of it is the coal-fire, which it is doing a large part in driving from domestic service. The action of the coal merchants is good evidence of this. The uncomfortable warmth of the position is found in the difficulty that some gas undertakings experience as winter approaches in keeping pace with their orders for gas-fires. For their own protection, gas managements are finding it good practice to offer to fit gas-fires free during the six months ending with September, and to charge no rent for the fires in these two quarters.

**The Latest Electric Kettle.**

The latest thing in electric kettles is the "Simpla," which, in different finishes or metals, is priced at from 4s. to 7s. 6d. for a pint size; from 6s. to 10s. 6d. for a two-pint size; and from 8s. to 13s. 6d. for a three-pint size. The pint size is rated to consume 500 watts an hour; and the 2 and 3 pint sizes, 1000 watts. The kettles are also wired with 2 yards of flex., which is much condemned by some thoughtful electricians. The heating element is contained in a copper envelope, and is taken right inside the kettle, so that it may be entirely surrounded by the water. This form of construction naturally produces a greater heating efficiency than some types of electric kettles can boast. But there are one or two points about the kettles to which it may be worth while some kindly disposed electrician to call the attention of the makers, in order to obtain their comments on them. The first is that one of the pint kettles that has been examined does not hold for boiling purposes one pint of water. The second point is that, as mentioned in the description, the heating element in a copper envelope is taken right into the kettle, and is surrounded by water. This we take it is on account of the copper being a good conductor of electricity; but water boiled in contact with copper (the copper not being tinned) would not appeal to us as being suitable for drinking purposes. There was a decided brownish tint observed in the case of a small quantity of water boiled in one of these kettles. About the prices, the tin kettle at 4s. (with the heating element in a copper envelope) is very similar in character to what one can buy for about 4½d., for use on a gas boiling-ring.

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**Sulphate of Ammonia and Manuring Oats.**—According to a short abstract, in the current number of the "Journal of the Society of Chemical Industry," of an article by Herren Mitscherlich and Simmermacher in two German publications, ammonium sulphate increases considerably the solubility of di- and tri-calcium phosphate in water saturated with carbon dioxide, and, within narrow limits, also enhances the manurial value of these two phosphates. When used as an auxiliary manure, ammonium sulphate has no effect on the utilization by oats of the phosphoric acid of superphosphate or basic slag; and it also appears to have no action on the phosphoric acid of the soil.

# THE TOULOUSE GAS-WORKS.

**Installation of Woodall-Duckham Retorts—Classification of Clinker.**

In the review of the proceedings at the recent Congress of the Société Technique du Gaz en France, at Toulouse, which appeared in the "Journal" for the 24th ult., it was mentioned that one of the items on the programme was a visit to the gas-works. It was made more interesting by a description of the works, with the help of lantern pictures, given by the Manager, M. Versepuy. As the works contain the first installation of Woodall-Duckham vertical retorts in regular operation in France, we give the following particulars in regard to them.

## The Works and Plant.

The works are situated at Marquette, on the banks of the Canal du Midi, so that supplies of both English and French coal can be obtained by water. The coal is removed from the barges by a grab working on a travelling crane 370 feet long, and projecting 112 feet over the canal and wharf. The barges are unloaded at the rate of 120 metric tons in three hours, by only two workmen. The crane and a conveyor are utilized for putting the coal into the store. A second unloading plant comprises a fixed slewing crane, erected on the bank of the canal, for loading the trucks of an electric train. The skips are carried away by the winch of another travelling crane serving a second coal-store.

Since 1905, the works have had twelve settings of nine 20-feet retorts, with mechanical chargers. By way of experiment, an installation of Woodall-Duckham continuous retorts has lately been put up. The coke is carried from the retorts to the screens on a conveyor. It is screened by means of jigger tables, and the different sizes of coke fall into pits, from which it is taken by electric trucks and a travelling crane to be put into sacks or stacked. Motor lorries are employed to convey the sacks of coke for delivery to the consumers. A clinker-screening plant completes the installation.

The purifiers are well arranged. There are two sets of four each for about 1000 cubic feet of material; and they can deal with rather more than 1000 million cubic feet of gas per annum. The material is never removed from the purifiers; revivification being effected *in situ* by means of a blower forcing about 350,000 cubic feet of air per hour, at a pressure of 50-10ths, into pipes 16 inches in diameter.

There are experimental works in which the gas can be sampled at any point of manufacture, and the entire production of one or two settings tested. There are likewise well-constructed lavatory and other hygienic arrangements, and an office for the payment of consumers' accounts, in which a Burroughs machine is employed with satisfactory results for making out and checking receipts for gas, hire of meters, &c. There are also Ellis machines for memoranda, statistics, &c.

The works supply a larger area than that of Paris inside the fortifications. Six governors control a distributing system of 210 miles in length, upon which there are 38,000 consumers. The maximum production of gas last year was about 2¼ million cubic feet per day.

## The Woodall-Duckham Retorts.

The installation of Woodall-Duckham retorts already referred to was put up by the Compagnie pour la Fabrication des Compteurs et Matériel d'Usines à Gaz; and their Manager, M. Heeley, furnished the following particulars in regard to it.

There are four brick-built chambers. The mechanism in use at Lausanne, which has been described in the "Journal," has been somewhat simplified and improved. For example, the measuring hoppers are filled and the coke is drawn off by hand. But the feeding of coal at the higher part and the drawing of the coke by a shaft with helicoidal teeth are done automatically. The construction of the chambers with special grooved and tongued bricks was carried through without difficulty; the workmen being able to remain inside the chamber while the work was in progress. The height of the chambers is about 25 feet, and their section varies from 1 ft. 8 in. by 5 ft. 3 in. to 4 ft. by 8 in. They will hold 2 tons of coal, and it will be carbonized in about ten hours. The producer, which is on the Lachomette principle, is placed at the higher part. The coal and coke are raised by a hoist. The entire plant has a clean appearance. There is no smoke nor dust, and the heat on and under the settings is by no means oppressive.

The President (M. Boutan) congratulated both M. Heeley and Mr. Duckham (who, as already mentioned, was present at the meeting) on the installation. M. Marquisan expressed his satisfaction at the improvements made in the Poole retorts, which he inspected five years ago, and which, even then, furnished a fairly satisfactory solution of the difficult problem of continuous carbonization. The plant greatly interested the members of the Society; and a hope was expressed that next year M. Heeley would give them the results of its working.

## The Hydraulic Clinker Classifier.

M. Versepuy also described the system in use for the hydraulic classifying of clinker, which the members had an opportunity of seeing. Of all the methods tried, washing with a current of water has given the best results. The clinker was originally collected

on the bottom of troughs arranged in steps, while the coke, being lighter, passed out at the end of the passage. The troughs, however, had to be frequently emptied; and it was with the view of avoiding this labour that in 1911 they were converted into a mechanical appliance, consisting simply of a jigger conveyor inclined at an angle of 10 in 100. The blades on the lower end and the passage in which they work in ascending the incline constitute a washer, the movable steps of which continually carry to the top the clinker which has fallen into the troughs; while the current of water flowing in the opposite direction takes away the coke. Preliminary screening or breaking produces lumps of convenient dimensions. A Decauville railway, bucket chain, and hoppers, suitably arranged, complete the plant, which requires little supervision or power.

Attention was drawn to the ready sale of the clinker in certain localities, for the manufacture of hydraulic lime, at prices varying from 2s. 4½d. per cubic metre (about 16 cwt. 78 lbs.) to 4s. 9d. per metric ton (2200 lbs.). The clinker contains as much as 45 per cent. of fuel, and sometimes 20 per cent. of utilizable coke, according to its origin.

M. Laurain, who had described the arrangements of the Paris Gas Company for dealing with clinker [see *ante*, p. 35], remarked that when it is to be used for pugging, bricks, &c., it must be carefully freed from coke; and it is always well to give the buyer a well-defined product in good condition. M. Coudelou said the uses of clinker dust were numerous. It was a profitable substitute for sand in tar for roads.

## ITALIAN GAS AND WATER ASSOCIATION.

### Forty-Second Congress.

THE last number of our contemporary "Il Gaz" contains an account of the proceedings at the forty-second congress of the Italian Gas and Water Association, which was opened in the hall of the Grand Theatre at Brescia on the 29th of May, in the presence of the Prefect, his Private Secretary, representatives of the "Pro-Sindaco" and the Provincial Chamber of Commerce, and about sixty gas and water engineers. Addresses of welcome were delivered by the authorities, and also by Sig. Laeng, the Manager of the gas-works.

Prior to the commencement of the business, the Committee presented the insignia of a Knight of the Crown of Italy to Sig. De Jongh. Then came the report of the Committee, the accounts, approval by the members of a grant of 500 lire (£20) for relief, and the award of prizes for the best papers read at the meeting of the Association last year. The winners of these were Signori Pacchioni, Remo, de Bartolomeis, Vanne, and Via. A Committee was appointed to deal with the awards to workmen; and a very heated discussion ensued. An endeavour was made to prove that the money premiums given to the men, and which are paid by them into the Chamber of Labour, would be detrimental to the gas companies; and it was questioned whether the awards should be made in money or merely certificates given.

Sig. Carlo Pouchain was then unanimously re-elected President for three years, and the following as members of the Committee: Bacchelli On. Comm. Avo. Guiseppe by the water engineers, and Comm. Sospisio, Ing. Enrico, by the gas engineers. This brought to a close the work of the first day. In the afternoon, a visit was paid to the Ancient and Mediæval Museums and the gas-works, which are now furnished with up-to-date plant which includes an installation of Klönne retorts.

The second sitting commenced at 9.30 a.m. next morning. A proposal for altering the rules of the Association in the matter of instituting money prizes for workmen, to be transferred to the Provident Fund or some similar establishment, and the making of honorary awards to the best employees, was approved. Sig. Pouchain proposed the institution of a prize of 1000 lire (£40) to the inventor of a method to develop practically the various applications of gas; and a Committee was nominated—composed of Signori Pouchain, De Jongh, Beria, De Bartolomeis, and Remo—to deal with the matter. Then the report on the taxation of works by Sig. Francesetti de Mezzenile, was read. It dealt in a lucid manner with recent legal disputes, and demonstrated the illegality of the application of the tax.

Owing to the short interval between the present and the preceding congress—a matter of eight months, reduced to six by the necessity for sending in papers two months before the meeting—there was not time for the preparation of papers giving results calculated to convey the impression that Italian gas and water engineers were really doing any work. However, Sig. Laeng read an exhaustive communication on the coal question; describing the measures adopted in other countries to avoid the continual increase in price, and proposing the foundation of an Italian institution similar to the German. Sig. De Jongh read a paper on advertising and collective propaganda for small works, and proposed the appointment of a Committee to deal with the subject. One was then nominated, composed of Signori De Jongh and the Managing Committee of the Association, with power to admit as members any persons they may deem suitable.

Sig. Krafft was re-elected the representative of the Association on the International Committee for the Unification of Screw-Threads; Sig. Bohm to occupy a similar position on the International Photometric Commission. On his proposition, authority was given to the Committee to elect a second representative.

The proceedings then concluded. The next congress will probably be held in Sicily.

In the afternoon, a visit was paid to the works of the National Radiator Company, and afterwards to the Castle and the Museo del Risorgimento. The day closed with a banquet, which, as already recorded in the "JOURNAL," was somewhat marred by the failure of the electric light.

The following day there was an excursion to Lake Iseo, and a banquet at Lovero. On returning to Brescia, the members separated with the general expression of good wishes.

The writer of the foregoing report says he must not omit a word of sincere praise of the indefatigable Sig. Laeng, the hard-working Manager of the Brescia Gas-Works, who organized and carried out all the arrangements, aided by his "amiable family." All will, he thinks, preserve a lasting *souvenir* of the entertaining visits and excursions.

In conclusion, he says: We hope, with our Italian pride, to see the next congress fertile in instruction, and thus demonstrate that, in the critical period through which the gas industry is passing, Italian science does not remain idle, but works, studies, and struggles intelligently for the triumph of the industry. The water engineers, by mutual co-operation in the public service, should take example from their learned colleagues, who, though in a small minority, contribute their science and practice to all discussions for the advancement of the kindred industries. However, whether water or gas engineers, we exhort our Italian colleagues to work with increasing zeal for our industries, since, above all for historical reasons, they still owe so much to other nations. It is the duty of every Italian technician to have his work at heart; and his first wish should be to form, by means of the Association, an Italian school which can rank worthily among the foreign societies, with the one object of defence and the continual improvement of the gas and water industries.

## WAVERLEY ASSOCIATION OF GAS MANAGERS.

### Annual Meeting in Edinburgh.

THE Waverley Association meeting passed off in its customary successful manner on Friday. The President's Address, which he very modestly feared would not cause a good discussion, proved to be one that called forth remarks from nearly all present. This could hardly be otherwise, when the large range of subjects touched upon was considered. The British Commercial Gas Association, gas fires, cookers, irons, heaters, and geysers, burners for rich gases, vertical retorts, commission adopted for obtaining a 50 per cent. increase in four years, and finally the establishment of a Commercial Section of the Association were all referred to; so that everybody could find something of interest in it. Mr. J. M'Leod, of Greenock, the President of the North British Association, reviewed the address throughout in a very happy vein, and afterwards controverted Mr. Richmond's views that vertical retorts were not being adopted in London. In reference to these retorts, the figures given by Mr. Blair were interesting, and should prove useful. Mr. Macfie's point was a good one, and one which has troubled many engineers who have had to review the question of such retorts in small works. It is, however, questionable if they can at present be introduced into gas-works making less than 50 million cubic feet annually, owing to the difficulty of adjusting the make to the requirements. Similar difficulties have been experienced where too many horizontal retorts are put into one arch in small works—the units being too large when lighting up or dropping settings is in question. The larger the number, however, which can be used in one setting, the more economical will be the heating; and the difficulty is to find the happy medium.

The description as to what various undertakings were doing, as regards fitting up and supplying gas apparatus, should be useful information, as each place has its peculiar requirements, and the choice can now be made accordingly from the different methods proposed. Mr. Vass's plan of closing up a fire-place opening when installing a gas-stove is surely not necessary with modern forms of this apparatus, and he must be drawing away by the chimney a large proportion of the heat which would otherwise be available for the heating of the rooms. That the decision of the Association to start a Commercial Section of their own is a good one there can be no doubt. The inclusion of Mr. J. Richmond, of Penicuik, and Mr. J. D. Keillor, of Hawick, on the Committee add two new comers to this district, who should be able to do good work in furthering the objects of the Association. Mr. W. S. Easson showed, by his speech at the dinner, that he has the gift of easily expressing his thoughts, which augurs well for next year's meeting.

A subsequent visit to the meter and gas testing station, carried on under the Edinburgh Magistrates by Mr. W. Gordon, was very interesting to those who found time to attend. The elaborate and accurate test holders, prepared under the instructions of Professor Airey, were first explained, and then the standard cubic foot bottle for testing and reverifying test holders was shown in action. The visitors examined the standard bar photometer with Mr. Gordon's patented holder for burners, for both gas and electricity, which enables all types to be tested upon the photometer, and to be brought to the right height and centre. Mr. Gordon took great trouble and pains to explain each piece of apparatus,

and many of the members learned points about the apparatus they use, which they do not frequently have the chance of obtaining. Mr. Gordon showed the first record of the stamping of meters in Edinburgh, by which it was seen that the first meter was stamped on Sept. 14, 1861, and was made by Messrs. W. & B. Cowan.

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The Ninety-Seventh Meeting of the Waverley Association of Gas Managers was held in the Cathedral Hotel, Edinburgh, on Friday, when Mr. THOMAS BLACK, of Coldstream, the President, presided over a representative attendance.

PROPOSED COMMERCIAL SECTION.

Mr. C. HAMILTON, the Hon. Secretary, read the minutes of the various meetings which had been held since the last gathering. From the records of the Committee meetings, it transpired that it had been resolved to form a Commercial Section. Communication was made with the North-Eastern District Commercial Association with the view to the affiliation of the membership; and the reply of the North-Eastern District was to the effect that, having gone thoroughly into the question, and after careful consideration, they recommended that it would be in the interests of the members of the Waverley Association, who are also ordinary members of the North British Association, to become individual members of the North-Eastern District Commercial Section on payment of the annual subscription of 7s. 6d., subject to the rules of the Commercial Section.

Mr. COWIE formally moved that the meeting instruct the Committee to start a Commercial Section, and that it be left to the Committee to see how this could be carried out.

Mr. M'MILLAN seconded the motion; and it became the unanimous finding of the meeting.

THE ACCOUNTS.

The annual statement of accounts showed that during the year ending May the income had been £32 1s. 9d.; and the balance in hand was £8 18s. 7d. The statement of accounts was unanimously adopted.

ELECTION OF OFFICE BEARERS.

The following office bearers were duly elected:

*President.*—Mr. W. S. Easson, of Jedburgh.
*Hon. Secretary.*—Mr. C. Hamilton, of Loanhead.
*Members of Committee.*—Mr. R. W. Cowie, of Dalkeith; Mr. J. Small, of Melrose; Mr. J. Richmond, of Penicuik; Mr. G. D. Keillor, of Hawick.
*Auditor.*—Mr. John O'Halloran.

GRATUITY TO THE HON. SECRETARY.

On the motion of Mr. D. M. NELSON, of Glasgow, seconded by Mr. A. BLACK, of Tranent, it was agreed to hand the Hon. Secretary (Mr. C. Hamilton) the sum of two guineas as a slight recognition of his valuable services.

AN HONORARY MEMBER.

Mr. J. Black, North Berwick, the father of the President, was unanimously elected an Hon. Member of the Association.

THE PRESIDENT'S MEDAL.

The PRESIDENT read the address, which appears (with the subsequent discussion) on p. 109, and then

Mr. COWIE, amid applause, handed over to Mr. Black the "President's Medal," taking occasion at the same time to refer to the admirable manner in which he had upheld the tradition of the office.

A hearty vote of thanks to the Chairman terminated the meeting.

ANNUAL DINNER.

At the conclusion of the discussion upon Mr. Black's address, the members dined together under the chairmanship of Mr. Easson. The loyal and patriotic toasts having been honoured, Mr. Daniel Macfie gave the toast of the "Waverley Association of Gas Managers." In doing so, he recalled that the Association was now admitted to be the oldest Association of Gas Managers in the United Kingdom, and remarked how the initial meeting had been held at Kelso. While it did not do to boast about being too old, it could be said that the Waverley Association was too small for its age. Until the Association succeeded in bringing into its membership all those engaged as gas managers or gas engineers in the Waverley district, it could not be regarded as fulfilling its duty. He was glad the Association was to be identified with a Commercial Section; and he hoped that great things would result from this. Mr. Blair (Helensburgh) acknowledged the toast. Mr. Henry O'Connor gave the toast of "The New President," remarking that Mr. Easson's qualifications for the presidentship were of the highest. He was in the centre of the Waverley district, and was brought up in the locality. Mr. Easson, in the course of his reply, said it would be his utmost endeavour to carry out the duties of President of the Association in an acceptable manner. Mr. A. Mackenzie (Edinburgh) gave the toast of "Kindred Associations," and referred with pride to the fact that all their kindred Associations had sprung from the old mother—the Waverley Association. Mr. Jas. M'Leod (Greenock), the President of the North British Association of Gas Managers, replied, remarking that the gas industry generally had benefited enormously from their Associations. He wished the Waverley Association—the mother Association, the parent Association of them all—long life and continued prosperity; and he hoped that, under Mr. Easson, there would be in store for the Association a career of greater usefulness. Other toasts followed. The harmony of the proceedings was contributed to by some of the members.

At the conclusion of the proceedings, the members, by permission of Mr. Gordon, the Chief Inspector of Gas-Meters in Edinburgh, viewed the apparatus for testing meters in the City Chambers.

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## AN ACCOUNTANT ON MUNICIPAL TRADING FINANCE.

A CONTRIBUTION to the discussion of the question of municipal trading, particularly in reference to the controversies regarding depreciation and the allocation of profits, was recently made by Mr. W. A. Sparrow, an accountant of Eastbourne. He approaches the subject from the point of view that services which affect the well-being of the whole community—gas and water and electricity supplies, tramways, and so forth—are rightly carried on by the governing body for the common good. All such enterprises should, however, be subject to severe restrictions in the matter of audit and financial obligation. Mr. Sparrow would have each made to bear its proper share of departmental and other expenditure, be properly assessed to local rates, and have such depreciation and reserve funds as are necessary to ensure solvency. Among the items specially enumerated as requiring attention in the financial adjustment of municipal undertakings is the making of proper charges for public lighting. This is a point of particular interest in towns in which municipal electric lighting works are run in competition with gas-works owned by companies. What a difference there would be in some balance-sheets if proper charges for public lighting were made in all these cases.

As to depreciation, Mr. Sparrow is of opinion that the system of raising loans for equated periods, including assets with short, medium, and long lives, is in practice unsound, and that where loans on this principle have been sanctioned a depreciation fund should be provided so as to meet the cost of renewing plant and machinery worn out before the loan is paid off. If the period for which the loan is granted represents the estimated life of the plant, he considers that no further provision need be made for depreciation. The question, therefore, is largely one of Local Government Board practice. Mr. Sparrow thinks it unfair to the present generation of ratepayers to form not only a sinking fund which will eventually pay off the cost of existing assets, but a fund which will provide for the renewal of the assets for the benefit of posterity. On the other hand, it is surely unjust that posterity should be asked to pay part of the cost of assets which have been worn out, and at the same time to provide others to take their place. The outcome of the whole matter is that the provision of a depreciation or renewal fund must depend upon the particular circumstances of the case—regard being had to the duration of the loan and the probable life of the asset.

On the subject of the allocation of the profits of municipal trading, Mr. Sparrow takes what we regard as the proper view. The practice of keeping up the price and taking profits to the relief of rates is, he says, very convenient and alluring, but is unfair to the consumers, and constitutes a breach of one of the reasons for municipal trading—viz., the supply of the commodity at as cheap a rate as possible. We never could see why a man who happens to be a consumer of gas or water, or a contributor to any profit-bearing municipal undertaking, should be called upon because of this to bear part of the rating burden of some fellow-citizen. It is true that the municipal credit has been used to raise money cheaply for the capital of the undertaking, and that use is made of the roads for laying mains and other purposes. But in return for these considerations the ratepayers get whatever sum the undertaking may be assessed at for rates, and the advantage of gas, electricity, and water at low prices. Where an undertaking has been unprofitable in its early days, Mr. Sparrow thinks it not unreasonable that when it becomes prosperous it should contribute to the rates a sum which will repay what it has previously drawn from the ratepayers. In all other cases, surplus profits should be applied to the creation of the essential reserve and depreciation funds, and then to a reduction of charge to the consumer.

This will continue to be regarded as a "counsel of perfection" so long as people prefer the method of indirect to that of direct taxation. In many cases town and district councils find it easier to take a lump sum from the profits of a trading undertaking than to put an extra penny or more on the rates. The poor, patient ratepayer has to bear the burden in any case, but with a difference which deludes him into the belief that if it is put on the gas bill and not on the rate demand-note it is no burden at all. This question of what should be done with surplus profits is really one of some importance. Using the well-known return of the Borough Treasurer of Preston on municipal undertakings, Mr. Sparrow points out that upwards of £1,500,000 per annum is obtained by the large towns as profit on their trading; and though against this there have to be set losses amounting to nearly £400,000, these communities were, as the net result, more than £1,100,000 to the good last year. It is interesting to note that no municipal gas undertaking is a charge upon the rates, and that where, among the corporations enumerated in this return, losses were incurred, they were mainly on account of water-works and docks.

# CALORIFIC STANDARD FOR NEW YORK GAS.

### Report by the Joint Committee on Calorimetry.

In the "JOURNAL" for the 4th of February last (p. 308), reference was made to an important investigation which had been conducted by a Committee consisting of representatives of the Public Service Commission of the Second Division of the State of New York and the Gas Companies of the State, with the object of fixing a calorific standard for gas. The Committee comprised Mr. W. R. Addicks (Chairman), Dr. A. H. Elliott, Mr. J. B. Klump, and Mr. R. M. Searle; the Secretary being Mr. C. H. B. Chapin, Secretary of the Empire State Gas and Electricity Association. The report has lately been published, and we have received a copy of it from Mr. Chapin. It occupies, with its seven appendices, nearly a hundred large pages. We give below a few particulars as to the history of the Committee, the extent of their labours, and the conclusions they arrived at.

The report is prefaced by a letter addressed to the Hon. F. W. Stevens, mentioning the circumstances attending the constitution of the Committee. It sets forth that on Dec. 8, 1909, the Commission issued a circular to corporations engaged in furnishing or distributing coal gas, water gas, and mixed gas within their jurisdiction, and appointed Feb. 1, 1910, as a date for a conference to interchange views on the necessity for a calorific standard and all questions necessary and incidental thereto. On the date named, the representatives attending appointed a Committee to co-operate with the Commission in the consideration of these questions; and thereupon the Commission nominated representatives to meet the Committee. After a preliminary gathering the representatives of the companies and of the Commission formed themselves into a "Joint Committee on Calorimetry." After that date, the investigation of the subject continued, and the history of the work and matter relating thereto is given in the report. The Committee conclude by saying that, as the Commission desired to have reported to them anything which it was thought required their consideration with the view to action being taken, they direct attention to certain paragraphs of the report which they indicate.

In the first portion of their report, the Committee show that there has been of late years a gradual movement in the direction of having a heating instead of an illuminating standard for gas. This movement has been based on the following three factors: (1) Modern appliances for the use of gas require that it should have heating value only, as the open-flame burner is rapidly disappearing on account of its inefficiency and expense. (2) The present candle-power standard seriously impedes desirable distribution in extended communities and for long distances, and, as a consequence, retards community development; while the rising price of enriching oils adds to the difficulty. (3) The present standards are wasteful of resources, and unduly burdensome on the consumers and the supplying company. In order to obtain accurate information on which to base the choice of a proper standard—particularly with reference to the needs of New York State—the Committee invited the assistance of a number of companies in the State. Laboratories for calorimetrical measurements were established at sixteen different places, and regular daily tests started. In some of the appendices to the report, the Committee give the results obtained, with extended comments thereon. Every effort was made by them to ensure that the work was being done with uniformity and accuracy; and they feel confident that the data are correct to within 1 per cent. They direct attention to certain important facts demonstrated by this experimental work. In the first place, a calorimetrical laboratory can be established at comparatively small expense. Next, calorimetric measurements can be made with great accuracy by men with no special scientific training except experience in, and attention to, proper operating directions. Finally, the calorimeter, as a practical instrument, is more accurate than the photometer. There is no uncertain feature in connection with its use, as there is with the type of burner and standard unit of light employed with the photometer.

The Committee then make the following remarks, which are contained in one of the paragraphs to which the attention of the Commission is specially directed:

> From the test results, no law could be discovered showing a relation between the candle power and the heat-unit value of artificial gas. The Commission's preliminary investigation indicated this; but the results, involving 6738 calorimetric and 9167 photometric observations, obtained by the Committee make it a demonstrated fact. For this reason, it would be very difficult indeed to state the heat value of artificial gas of a quality equal to the State standard for candle power, inasmuch as the companies generally distributed gas above the legal standard—in some cases as much as 17 per cent. For the information of the Committee, however, two plants were operated close to the State standard. The results show that gas meeting the State standard of candle power would have approximately a monthly average of 585 B.Th.U. The question immediately arises as to whether this value should not be taken for the heating value standard of gas to be distributed in New York State.

The Committee point out that, in order to meet the suggested heat-unit standard, most companies would have to enrich their gas during a portion of the twelve months; and they remark that this would be expensive, especially with the increasing price of oil. Other things being equal, they consider it would be to the advantage of consumers and manufacturers if enrichment were reduced to a minimum. After further discussing the subject, they say it is difficult, in view of the uncertainty as to how fast changes in the conditions governing gas manufacture and distribution will take place, and as to what the final situation will be, to determine the proper value at which to set the standard. Some time in the future it may have to be 525 B.Th.U. or lower; and even with the best coals and the highest-grade plants, as low as 550 B.Th.U. Taking all the conflicting factors into consideration, it is the judgment of the Committee—and they specially direct the attention of the Commission to it—"that a total heat value not exceeding 570 B.Th.U. monthly average, measured at the point where the gas leaves the manufacturing plant, corrected to a temperature of 60° Fahr. and to a pressure of 30 inches of mercury, as measured by the rules of the Committee accompanying the report, is the standard which will best serve the interest of the people of New York State.

The Committee remark that the conditions governing the use of the standard are important. Gas manufacture is not, they say, an exact science but a complex operation including a number of distinct processes, which makes it impossible for a gas company to deliver an absolutely uniform product. This points to the necessity of applying the standard as an average for a reasonable length of time. A month has been adopted elsewhere, and is recommended for New York State. If a company fall below the standard for a few days, it will then be necessary for them to produce above the standard, at an economic loss, so as to have their monthly average satisfactory. In order to protect the public against improper management, by which there would be wide departures from the standard, the Committee considered the question of setting a minimum value; and they came to the conclusion that a 5 per cent. deviation for not exceeding three consecutive days would be adequate protection to the consumer. In extraordinary conditions, due to failure to obtain supplies or to accident in the plant, the Commission might, however, properly suspend the operation of the standard.

In the concluding paragraphs of the report, the Committee deal with the position of the users of flat-flame burners in view of the establishment of a heat-value standard. They suggest, as mantles have become so cheap, and the saving effected by them is so great, that in a short time no one will use open-flame burners except for some peculiar reason. But, for the satisfaction of those who feel that they must use them, the Committee say it may be stated positively that "any artificial gas having the heating value of the standard recommended would have sufficient illuminating power, though at times lower than at present, to make the gas useful in locations suitable to open-flame burners. The use of a very small percentage of the gas for such a purpose should not prevail against the general usefulness of the whole product." The Committee recommend, therefore, "that no candle-power standards should be considered in connection with the heat-unit standard recommended."

As already stated, the report is followed by seven appendices. They contain particulars of the calorimetric and photometric tests carried out by each of the companies, the tabulated results of the investigation, a chart showing the indefinite relation between the heating and illuminating values of gas, the effect of distribution on these values, and remarks on calorimetry and photometry. Two pamphlets used during the investigation—one being the calorimetric rules, regulations, and specifications, and the other the plan of the calorimetric investigation, and an explanation of the test and report forms—are reprinted.

## The "B.C.G.A." File.

The publications of the British Commercial Gas Association have already become so voluminous, that, if one wishes to keep a complete set for reference, particular care must be taken of them, and the samples must be "stored" so that they can be speedily consulted. The best form of "storage" is a file; and the best form of file one of the Association's. One of these files, containing a complete set of the literature issued by the Association, with schedule of prices, is a thing of value which should find a place in every gas office from the smallest to the largest. "Ammunition" in commercial warfare is constantly being required for different purposes; and from a set of filed publications one can pick out at once precisely what is required. The pamphlets, picture post-cards, &c., have nothing about them of an extravagant nature, and they are all productions that one can, without hesitation, send into any house in any district. This file is another evidence of the thought given to detail in connection with the work of the Association, and which detail rounds-off the comprehensive services of the organization to the industry.

**Graetzin Lamps in Paris.**—In the last number of the "JOURNAL," we gave some figures, from a French contemporary, in regard to the number of "Pharos" lamps in use in Paris. The General Manager of the French Graetzin Company (M. Bergner) has written to the same publication to point out that the lamps of his Company are making a good show in the city. In addition to the 600 in use in some of the principal thoroughfares, a number have been adopted for outside lighting by various large establishments. They are supplied on hire at very advantageous rates by the Paris Gas Company.

# REFRACTORY MATERIAL IN GAS-WORKS.

By Thomas Holgate, F.C.S., M.Inst.C.E.

The Committee of the Institution of Gas Engineers entrusted with the subject of refractory materials are to be congratulated upon their recent report, and upon the work done by them since their inauguration in 1909. The fact that certain difficulties have been experienced is not surprising when the complexity of the subject is remembered. But the lines followed appear to be sound; and this was to be expected from the fact that the Committee have been co-ordinating the knowledge of both makers and users, under the advice of a gentleman recognized as one of the greatest authorities in the kingdom. From these preliminary sentences, it will at once be understood that this article is not directed towards adverse criticism, but is only suggestive of an extension of the work already begun.

In the first place, one such extension appears to be desirable relative to the table found in the Committee's 1913 report; and that is the addition to it of a chemical analysis of the fourteen samples. To state this matter in its proper light, it is necessary to quote the clause, respecting chemical analysis, which appears in each of the three sections of the specifications issued by the Committee. It first appears on p. 465 of the "Transactions" of the Institution of Gas Engineers for 1910, as follows:

> "A complete chemical analysis of the material is to be provided when required by the engineer (or purchaser), for his personal information only."

And on p. 467 in the appendix:

> "The silica should be determined by two evaporations with an intervening filtration; and the alumina, lime, and magnesia, by two precipitations. The amount of titanic oxide should be indicated, and not confused with alumina and iron. The potash and soda should be separately determined."

These two passages are quoted alongside, to show that the Committee realize the importance of the chemical analysis; but for my immediate argument only the former is necessary—the latter will be more particularly referred to in a later paragraph.

Seeing that the samples of retort material are tabulated by letters of the alphabet, and not by names of makers, there seems to be no reason why the analysis referred to in the specification should not find a place alongside the physical tests. Such a course would appear to be no violation of the Committee's clause. But if it were held to be so, then it would not be difficult to modify the clause to permit of the analyses being recorded in future reports.

There is another point to mention in connection therewith, and that is that the initiative is left to the gas engineer to ask for the analysis from the maker of the fire-clay goods. In the cases tabulated, this may not in all instances have been exercised; and so the Committee may have been unable to compile a complete statement. As further tests are promised during the coming year, my suggestion is that the engineers obtain chemical analyses that refer to the same material as that which they submit to the Committee's technical adviser; and that the Committee, if need be, have these analyses checked, and then published along with the tests for melting-point, change of volume, and porosity.

It is perhaps desirable to look at the matter and see why the chemical analysis should not be overlooked; in other words, why the gas engineer should exercise the option mentioned in the specifications. Firstly, from the standpoint of the user of the refractory materials. The information given in the table of the 1913 report refers to certain specific pieces of retort material which have been tested under a standard set of conditions, and, therefore, are comparable with each other. But this set of tests of physical properties only indicates the merit of these specific samples, and does not give any index to the variable behaviour which may occur through differences of material or of treatment at the manufacturer's works, or of the results likely to occur from the use of the material under a diversity of conditions. In other words, there is nothing by which the given physical behaviour can be connoted. The table shows how well the specification is being realized physically, but not what is the nature of the material chemically which makes possible such achievements. We are not able to recognize what proportions of silica, alumina, and the other coustituents have contributed to the given result. If, however, the gas engineer on using the refractory material finds that some of his retorts have stood better than others, he cannot very well trace out the anomaly by making further physical tests upon it; but he can have various portions tested chemically, and see whether variations existed there originally, or whether ashy matter and other substances have since gained access to it and modified it.

Secondly, from the point of view of the manufacturer of fire-clay goods. Presumably, the maker will systematically and frequently test chemically and physically the material he is using, and thereby guard himself against changes in the composition and condition of Nature's material. But if he is to be on sure ground, he must also know the analysis of the finished article, with its percentage of "grog." He must know these facts at the two extremes of his process, in order that he may know what it is which is raising or lowering the results in the physical tests, especially that of melting-point. But doubtless the cautious manufacturer hesitates to modify his mixtures or his kiln-firing, until he knows the results of his retorts as used in the gas-works; and in the meantime as much as three years may have elapsed before such information is available. He may even have reports from the various users of his wares, nominally of the same blends of clay and grog, which are conflicting in their testimony; and thus he may for a long period be unable to come to a decision. But if every sample dealt with by the Refractory Materials Committee has been tested chemically as well as physically, even though the name of the maker is not revealed, he has a guide as to the degree of probability of success that may be expected for any suggested improvement. In other words, he may be helped by definite information drawn not only from his own experience chiefly with his own wares, but from the experience of other careful observers of the wares of many other makers. In this way, it may reasonably be expected that the general level of excellence of manufacture would be raised; and besides this there would accumulate a mass of information that would enable both the maker and user to co-ordinate chemical composition with refractory behaviour more closely than has hitherto been possible.

The suggestion that the writer therefore makes is that each sample tested physically should be analyzed chemically, and the two results published in conjunction. He has already ["Journal," Vol. CIII., p. 573] referred to the necessity for the chemical analysis being as complete as it can possibly be made, and the specific directions in the appendix to the Committee's specification (quoted above) as far as they go are directed to the same end. The results to be achieved by securing highly resistant fire-clay goods are worth any expense that may be necessary to pay for the various tests and analyses; but if any difficulty under this head should arise, then it would, in the writer's opinion, be more desirable to have a score of samples tested both physically and chemically, than to have two score tested only physically. He has in his possession a quantity of information relative to the co-ordination of chemical composition and melting-point drawn from various sources; but the data would be greatly improved if it were drawn from one source, or at any rate from one well defined system of testing, carried out under similar conditions. For there is in the information already gathered sufficient to show that many of the perplexities of interpretation would be cleared away if the chemical analyses of the refractory material were more detailed and complete than is usual. In this matter analytical chemists are largely dependent upon their clients; and gas engineers can do a great deal towards accomplishing the desired end if they will require that the chemists—either directly or through the manufacturer—shall furnish reports of analysis that embody the most recent attainments in this branch of science.

In carrying out this suggestion, it is well to consider within what limits it is possible or necessary to go; and in general it may be said: (1) That every chemical element present in the sample dried at 100° C. should be separately stated; and (2) that as far as possible the state of combination of each element should be given. This extent of detail is necessary, because it is known that the melting-point may be affected more by several elements being present each in small percentages than by one element present to the same total. And, again, the depression of the melting-point is affected by the state of combination of each element. A simple illustration of this last fact is to be found in the oxides of iron—viz., ferrous oxide (FeO); magnetic oxide of iron ($Fe_3O_4$); and ferric oxide ($Fe_2O_3$). These not only influence the melting-point, but they differ in their readiness to be changed by the oxidizing or reducing atmosphere surrounding the refractory material. These facts have become increasingly clear of late years; and yet it is rarely, if ever, stated in any analysis of clay or clayware what is the percentage of magnetic oxide present.

The part played by iron in its various combinations in affecting the fusibility of clay, is known in a general way. But what is wanted is greater definiteness; and the first step therein is the statement in the chemical analysis of each degree of oxidation. The magnetic oxide is quite liberally distributed, often in small percentages, through the various strata of clay; and its content should be assessed when fire-clay is in question. Again, while a discrimination is here called for, due to an altered percentage in the ratio of iron to oxygen, there are reasons for believing that discrimination is necessary also in the case of titanium, although its ratio to the oxygen of combination may not vary. Many years ago, Mr. E. Riley, F.C.S., showed the wide-spread distribution of titanium oxide in clays; but it is only of late that the fact has received due recognition in its bearing on refractoriness. But according to recent crystallographic investigations, it is rendered highly probable that rutile, anatase, and brookite, each having the empirical formula $TiO_2$, may have different effects in depressing the melting-point, according as they function in the following molecules: Rutile ($Ti_2O_4$); anatase ($Ti_4O_8$); and brookite ($Ti_6O_{12}$). In the case of this element, it would therefore be necessary for the technical staff of the clayworker to follow up the chemical analysis with a microscopic examination of the clay to identify the several crystallographic forms assumed by these minerals.

The part played by titanium oxide in its various isomers has been recognized and described as important by geologists in their study of the composition and transformations of various clays; and it is therefore bound to affect the behaviour of the clay in its course of manipulation, at the kiln or at the retort-setting. While it is impossible to deny to the geologist the importance that he attaches to the rôle of titanium oxide, in the changes that have

occurred in fire-clays during their formation through vast periods of time, the fact remains that its content is always relatively low; and we are led to the opinion that there may be in clay other components which, though small in percentage, are yet potent in their influence. And this is a view which is in conformity with the general interpretations of the modern mineralogist—viz., that many changes may be, and actually have been, determined by the presence of minute quantities of a certain ingredient, to which the name of a "mineraliser" is given.

Further illustrations of the importance of traces of substance in determining what direction a chemical change will take under given circumstances could be given; but we must now pass on to gain some idea of what we are likely to meet with in clay.

*(To be continued.)*

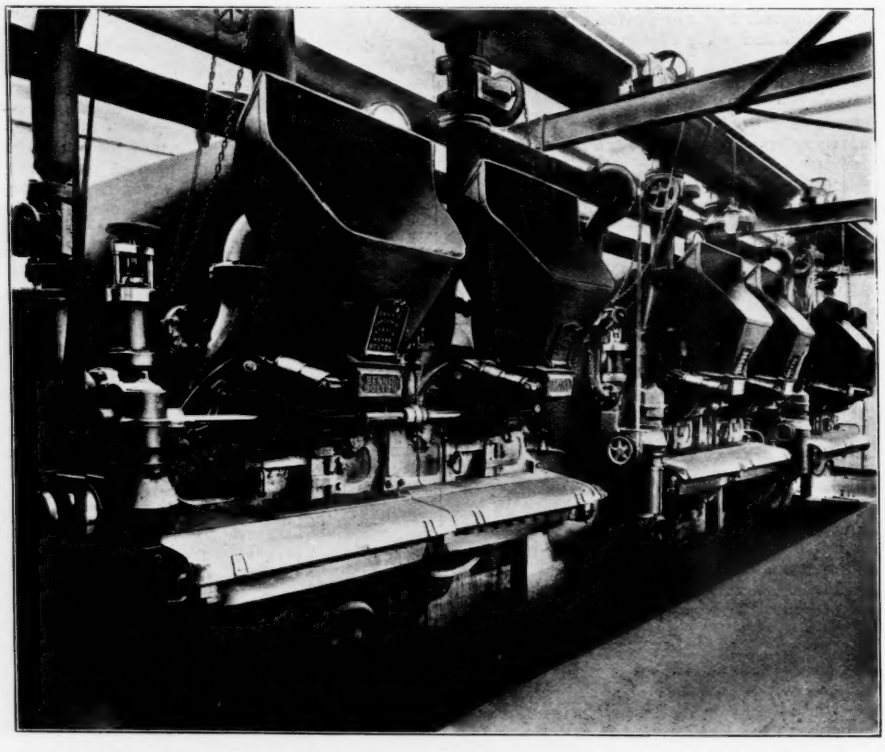
# BOILER-FIRING BY COAL AND GAS.

## The Bennis Dual Method.

An interesting instance of what can be done in the machine firing of boiler furnaces by the application of both gas and coal is afforded in an installation recently completed by Messrs. Edward Bennis and Co., Limited, of Little Hulton, Bolton, at the South Staffordshire Mond Gas Company's works at Dudley Port, Tipton. The plant at these works comprises eight producers, each capable of gasifying 20 tons of fuel per day of 24 hours, and generating sufficient gas to drive engines of 2000 H.P. continuously. The total capacity of the present section is thus equal to 16,000 H.P.

The boiler plant of the Company consists of three Lancashire boilers, each 9 ft. by 30 ft., with extended flues, and working at 120 lbs. pressure. They are fitted with superheaters—the gases discharging into an economizer containing 4000 square feet of heating surface. The total grate area of each boiler is about 57 square feet. In April, 1910, it was decided to substitute mechanical firing for hand firing; and an installation of Bennis machine stokers was put in, which has aroused considerable interest in Lancashire and Yorkshire. They are arranged to burn either coal or gas, and are of the firm's sprinkler type, an integral feature of which is the self-cleaning compressed air furnace. A definite guarantee was given that the evaporation of each boiler should not be less than 12,000 lbs. of water per hour, with an overload evaporation of 15,000 lbs. per hour when desired for short periods. An efficiency of 72 per cent. was also conceded.

Some members of a qualified staff of practical chemists employed by the Company were entrusted with the task of taking tests which should establish the results of the work actually done by the boilers. These tests showed not only that the guarantees



THE BENNIS BOILER PLANT—COAL AND GAS FIRED—AT THE SOUTH STAFFORDSHIRE MOND GAS COMPANY'S WORKS, TIPTON.

were maintained, but that an appreciable increase on the figures had been achieved. For instance, instead of the 15,000 lbs. per hour for the overload evaporation, 17,000 lbs. of water per hour from each boiler was obtained.

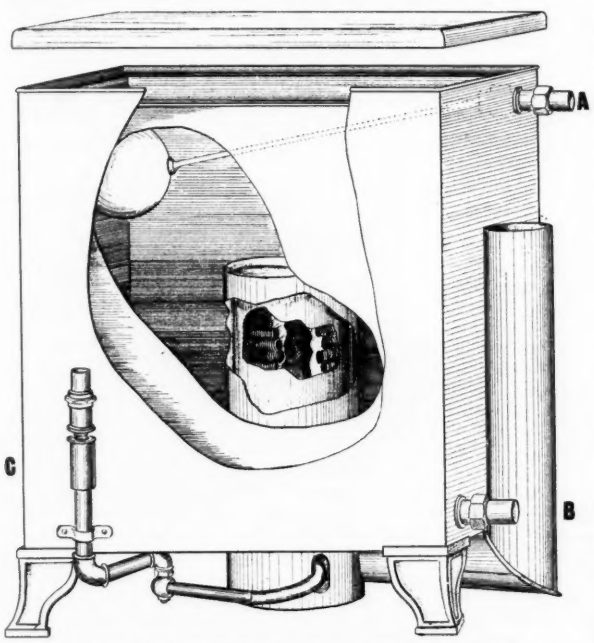
Prior to the installation of the machine stokers, considerable incovenience was experienced owing to the exigencies that required steam to be kept up both during the night and from midday on Saturday until early on Monday morning, in which period it was desirable that labour requirements should stand at a minimum. The problem with which the Company were confronted was whether the mechanical stoking plant could be so arranged that it could be coal-fed in the usual manner at ordinary times, and the boilers gas-fired during the hours of night and at the week-ends; and Messrs. Bennis showed that with their system of machine the desired quality was perfectly practicable.

A reference to the accompanying photograph will show the gas-ducts let into the top flange of the front of the stoker, and secured by means of a gas-tight joint. The baffle-plates, which are situated behind the front, are arranged with a passage, the outlet being over the grate. The gas thus passes from the ducts to the furnace. There are two ducts to each flue—*i.e.*, four to each boiler—each pair containing a breeches pipe placed immediately behind the hopper, and passing thence to the gas supply. It is, of course, essential for air to have access to the gas. A valve is therefore placed on the furnace front, with an adjustable cover to regulate the amount of the air supply. The air is conveyed into the furnace through a separate air-duct, and does not mix with the gas until it reaches the inside of the flue, where ignition takes place.

This dual method of firing boiler furnaces had been in operation for two years at the Mond Company's works; and the results have been such as to justify them in applying the idea to their extensions of boiler plant. They have, therefore, placed a repeat order with Messrs. Bennis for machines of the same pattern as those already supplied for their new installation of boilers. This fact in itself would appear to afford sufficient evidence of the efficiency of the method, and its satisfactory solution of the problem it was designed to solve. In a letter received by the firm from the Secretary of the Mond Company, he states that the thermal efficiency obtained during a six months' run under all conditions and variations of load, including times when parts of the plant were off for cleaning and inspection, was 73 per cent.; the boilers being fired with slack during the day and with gas during nights and week-ends. The average quantity of water evaporated per boiler per hour for a month's run was 14,880 lbs. The water is preheated in a Green's economizer.

## PARKINSON'S "GACYLOTE" HOT-WATER TANK.

READERS of the "JOURNAL" will probably remember that the Parkinson Stove Company, Limited, of 129, High Holborn, have for many years manufactured the "Gacylote" cylinder water-heater. They have now introduced the tank pattern (shown in the accompanying illustration), which, while embodying many of the special features of the older type, possesses certain points of difference which may be shortly indicated. The main alteration is that the cylinder is designed for supplying hot water above its level, and is consequently made of sufficient strength to stand considerable pressure; while the tank, being fed by a ball-valve, and only delivering water at or below its level, can be made of lighter material in a simpler form, and is therefore cheaper.




A. Water Inlet. B. Hot Water Outlet. C. Thermostatic Valve.

As will be seen from the illustration, in outward form the "Gacylote" tank is a square box, closed at the top—the only opening being on the bottom. Through this opening a heating chamber is inserted, which extends right up inside the tank. The gaseous products pass up the centre of the heating chamber, and then descend in contact with its sides, passing through a number of heat-conductors, which absorb the heat from the products, and convey it by conduction to the wall of the chamber. The waste heat escapes at the bottom at a low temperature; and a socket is provided to which a vent-pipe may be attached when the heater is fitted in a small room. As already mentioned, the cold water is supplied through a ball-valve, and is directed to the bottom of the tank; while the hot water is drawn from a tap at B.

The working of the "Gacylote" is entirely automatic. When hot water is drawn, by turning on any tap connected with the outlet, fresh cold water passes in through the ball-valve. This reduces the temperature of the contained water, and the thermostat opens a full supply of gas. When the hot-water taps are shut, the cold water continues to flow until the tank is full, and it is shut off by the ball-valve. The gas remains full on until the contained water reaches the set temperature, and then closes down to a small flame, sufficient to maintain the heat at 160° to 170° Fahr. The low consumption of gas required for this purpose—viz., less than 2 cubic feet per hour, or 1½d. per day, with the 15-gallon size—is one of the special claims put forward for the tank. Being made double—the inner lining of copper, and therefore non-rusting, and the outer shell of iron, with an intervening layer of felt round the sides and over the top—radiation is practically entirely prevented; and this, in combination with the heat-conserving effect of the internal heating chamber, results in a minimum consumption of gas for heat maintenance. When it is considered that a circulator attached to an existing system of pipes and tank will usually require at least 10 cubic feet of gas per hour for keeping the water hot, and that this consumption goes on all day, irrespective of the actual drawings of hot water, the economy of the "Gacylote" tank is evident. The tank can be easily fixed—no special gas-pipe being needed; and with it a hot bath can be had in a moment at the cost of less than a penny.

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It is announced in the current number of the "Co-Partnership Journal" of the South Metropolitan Gas Company that the Chairman—Mr. Charles Carpenter, D.Sc., M.Inst.C.E.—will read a paper, dealing with some aspects of co-partnership, before the Economic Science and Statistics Section of the British Association at their meeting in Birmingham in September.

## THE JET PHOTOMETER AS AN INSTRUMENT FOR TESTING ILLUMINATING POWER.

By A. RENFRED MYHILL, of Birmingham.

AN engineer of a small country gas-works once boasted that he could obtain over 12,000 cubic feet of gas from a certain coal—the illuminating power of the gas averaging 16 candles. As this multiple was abnormally high for this particular coal, a gentleman present ventured to ask what means the engineer had of testing the illuminating power. He was told that the jet photometer was the instrument used. The abnormality explained itself!

It used to be a common practice to "rate" a jet photometer by connecting it up to a gas service supplying gas to a bar or table photometer, and testing the actual illuminating power at 5 cubic feet per hour by means of the bar or table photometer—using either candles or a pentane standard. The jet was then regulated so that the flame reached a predetermined height; and the position of the needle on the scale was marked definitely as corresponding to this illuminating power.

Several such tests were carried out, using gases of widely different illuminating powers, until a scale was built up, ranging from (say) 12 to 20 candles. The jet photometer was then declared ready for use, and was installed—probably in another town, at any rate in another situation, where it was more than likely that entirely different conditions prevailed. In its new station, its indications were taken as accurate measurements of candle power.

The engineer whose jet showed 16 candles had, in all probability bought his instrument in London—a hundred miles away from his own works, where different coal was carbonized, and where the composition of the gas used in calibrating the jet was entirely different from that of the gas whose illuminating power was shown to be 16 candles. It is highly probable that if he had tested his gas with a pentane standard, his test would have shown nearer 14 than 16 candles.

The jet photometer, strictly speaking, does not measure illuminating power. It is a test of specific gravity, rather, although a somewhat erratic one. A light gas, as a rule, gives a long flame, and, consequently, a good jet reading; but this rule has many exceptions. The length of flame with a given pressure of gas depends to some extent on the composition and percentage of unsaturated hydrocarbons present; and it is in the matter of these hydrocarbons that the jet photometer will be found to disagree with the table or bar photometer. Carburetted water gas of 22 candles often gives the same jet reading as coal gas of 15 candles, so that the jet is particularly unsuited for town gas which is enriched with water gas—in fact, where the proportion of water gas is at all variable, it is not too much to say that jet readings are absolutely useless.

Benzene enrichment is, in the opinion of the writer, indicated fairly accurately with the jet photometer.

A method of using the jet photometer to advantage is to employ it in conjunction with a bar photometer. The gas made should be tested once a day—preferably first thing in the morning, and, at the same time the jet reading should be taken. [By the "jet reading" is meant the pressure, indicated on the King's gauge, necessary to maintain the flame at any predetermined height.] Throughout the day—say, every hour—the jet reading should be taken again; and if the same coal is being used, and the same conditions adhered to throughout the day, it is highly probable that the jet reading of the same value as that obtained at first will correspond to a gas of the same illuminating power as that shown by the bar photometer.

Should the illuminating power be deemed satisfactory, it is only necessary to vary the pull on the retorts, &c., from time to time, keeping the jet readings constant. If the illuminating power as tested at first is considered unsatisfactory, the conditions should be altered until a satisfactory candle power has been obtained, and the jet kept constant throughout the day. It is advisable to make these daily tests of the true illuminating power in order not to be misled. Should the coal be changed during the day, bar photometer tests must be carried out once more.

A good position for the jet and bar is at the outlet of the exhausters—the gas getting here directly from the retorts, so that its quality may be tested at an early stage of manufacture, and faults may be more easily remedied. As the gas, however, is in a crude state, it will be necessary to place a small oxide purifier before the instruments.

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### Producer Gas.

We have received from the proprietors of Le Mois Scientifique et Industriel a publication in French, bearing the title "Le Gaz Pauvre." It is a discussion of the advantages or otherwise of low-grade or producer gas, and a comparison of it with steam for power purposes. The work deals with the difficulties of selecting one or the other system; for though in small-scale working the advantage doubtless rests with producer-gas motors, the difference diminishes greatly with increasing size of plant. The comparison of the two systems from all points of view is very thorough and exhaustive. The last part of the brochure deals with subjects relating exclusively to producer gas, including its application to heating; and finally a model installation for its use is described.

# THE EXAMINATIONS IN "GAS ENGINEERING" AND "GAS SUPPLY."

### List of Successful Candidates.

THE pass-lists for the last examinations in "Gas Engineering" and "Gas Supply" have been sent by Sir Philip Magnus, M.P. (the Superintendent of Technological Examinations of the City and Guilds of London Institute), to the Institution of Gas Engineers; and they have been forwarded to us by Mr. Walter T. Dunn, the Secretary, for publication. The questions set by the Examiner in the first-named subject—Mr. Thomas Glover, of Norwich—were given in the "JOURNAL" for the 22nd of April; and those put by Mr. Walter Hole, of Leeds, on "Gas Supply" will be found in the succeeding issue. The names of the prize winners will probably be announced in the course of a few weeks.

## GAS ENGINEERING.

### FINAL GRADE.
#### First Class.

Arnold, Stanley H.
Booth, William E.
Brown, William F.
Carpenter, George E.
Crowdy, R. St. J.
Currier, George E.
Doram, Henry E.
Driver, Morris
Dumbleton, Harry
Dyson, Thomas
Fulton, David
Gage, Henry
Gripton, Harold C. E.
Henn, Karl
Hood, John
Lacey, Leonard
Linnell, George T.
Lowe, William A.
Morley, Frank I.
Morris, James D.
Ramsden, Reginald
Richbell, Philip
Shaw, Balmforth
Snape, James E.
Tarn, Thomas T.
Taylor, James
Townsend, Harry
Whitlock, C. W. M.
Whitworth, Arnold
Williams, Alfred J.
Woolley, Philip L.
Wortley, George W.

### FINAL GRADE.
#### Second Class.

Allison, Harold P.
Bagby, Ralph
Baldwick, Kenneth W.
Barratt, Thomas W.
Bates, John W.
Branson, Daryll J.
Brasington, F. T.
Calvert, Eric E.
Carmichael, Robert
Dickinson, Harold A.
Green, David
Hall, Arthur
Hester, James D.
Hulme, Humphrey
Lucas, Arthur A.
Millington, Percy
Payne, Crompton S.
Peat, Wallace H.
Peel, Fred.
Pilbeam, H. T. W.
Ponting, Arthur J.
Prentis, Arthur E.
Riley, William H.
Searle, John A.
Shewring, Harold
Strickland, Cyril C.
Taylor, Albert C.
Tradewell, Clarence
Vince, Francis H.
Whitney, Alfred C.
Williams, F. B.
Worthington, Frank

### GRADE I.
#### First Class.

Adams, Thomas E.
Arthur, Edward
Ashworth, John D.
Ashworth, Richard
Barr, Robert
Battersby, Walter H.
Chapman, John H.
Clark, Richard G.
Coe, Arthur
Corder, Alwyn St. D.
Cornish, James H.
Cox, Harry C.
Cunningham, W. T. P.
Curr, Thomas
Dagg, Richard
Davies, Peter
Davis, Joseph F.
Denning, Samuel T.
Edwards, Frederick
Escreet, Hubert J.
Gibson, James W.
Gladstone, William E.
Gooch, William S.
Goodwin, Herbert
Greenwood, Herbert
Hamilton, George
Hardiker, Ernest
Hepple, Frank
Hinks, Walter
Hollsworth, Frederick
Humphrys, L. G.
Inns, Charles H.
Jacobs, Alfred F.
Johns, Tom V.
Jones, John W.
Kaye, Elliott
Kirkbride, Herbert D.
Laithwaite, Tom P.
Law, Thomas
Litchfield, Arthur
M'Lusky, James
M'Nicol, James
Mills, Albert H.
Moreton, Roland F. V.
Payman, Joseph
Payne, George L.
Pennington, Gardner
Pennington, Jesse F.
Philpot, Herbert J.
Pickles, Harold
Roberts, John L.
Robinson, John H.
Robson, David E.
Rudge, Tom
Rust, Joseph F.
Simpson, Robert M'D.
Sutton, John E.
Thomson, Andrew
Troughton, F. C.
Turnbull, William
Whitworth, William
Wilson, Charles M.
Witham, Frank M.
Wynne, Harold

### GRADE I.
#### Second Class.

Bateman, Henry L.
Bradley, William T.
Bridge, Harry
Brookbanks, Alfred
Brown, Vernon S.
Butler, Thomas J.
Carr, John T.
Carpenter, Charles W.
Coleman, George
Cook, Geoffrey N.
Cotton, Arthur F.
Crowther, George B.
Cullen, John F.
Duncan, Clifford
Elder, John S.
Felton, Colin B.
Fender, Lionel R.
Ford, John E.
Ford, William E.
Frost, Eli
Gibson, Robert
Gilbey, Walter D.
Greaves, John
Gould, Thomas L.
Hardman, George E.
Harrison, George
Hastings, Bertram S.
Hudson, Arthur T. R
Hughes, Edward G.
Hunt, Arthur V.
Imbrie, William J.
Jacobs, Francis J.
Jones, Ernest
Jones, Thomas M.
Kenshole, William T.
Leach, Howard
M'Lusky, Drummond
Madsen, Hans A.
Millett, Thomas W.
Morgan, Graeme R.
Muddiman, Ernest W.
Nixon, Horace
Oliver, Frank
Orr, Graeme C.
Orr, Thomas
Parsons, George W.
Price, Conrad T.
Reeves, Sidney C.
Rider, Douglas
Robinson, Joseph
Roper, John
Sadler, Stanley
Slann, Thomas A.
Small, Howard B.
Storey, John
Sugden, Wallace
Thomas, Arthur F.
Thrate, Geoffrey
Vickers, Charles E.
Warby, Ernest H.
Warr, Raymond G.
Warren, Leonard W.
Wheatcroft, Ernest
Wills, Tom A.
Wilson, Walter

## GAS SUPPLY.

### FINAL GRADE.
#### First Class.

Ayre, Frank
Bagshaw, William J.
Baldwick, Kenneth W.
Bartlett, Henry J.
Batt, William
Blondin, F. J. G.
Boot, Henry J.
Bradbury, Arthur
Branson, Daryll J.
Breary, John E.
Brown, William
Burden, George E.
Carpenter, George E.
Darby, Norman L.
Dean, Harry W.
Dickson, James
Francis, Richard N.
Goodier, Herbert
Hare, William H.
Henn, Karl
Howes, Frederick N.
Hurst, Edwin
Janaway, Frederick J.
Johnson, John R.
Lacey, Norman H.
Livesey, David T.
Low, William E.
McDonald, Robert B.
Marsh, Frederick G.
Mobbs, Rupert E.
Moulder, James J.
Munro, James R.
Murray, Ronald
Nalder, Lawrence M.
Oughton, Ernest L.
Osborn, Francis E.
Parsons, Beresford F.
Peters, Alfred G.
Pickering, Percy
Prentis, Arthur E.
Pykett, Frederick
Redding, Arthur H.
Richardson, Albert E.
Ringe, Allan
Roberts, Arthur R. W.
Scears, Ernest
Sessions, Thomas A.
Shaw, Balmforth
Shewring, Harold
Smith, Arthur L.
Spinks, William L. S.
Town, John
Wadsworth, Maurice
Ward, John J. H.
West, Sidney A.
Williams, Frederick B.
Wilson, George G.
Worsfold, Frederick J.

### FINAL GRADE.
#### Second Class.

Axon, Samuel
Beal, Charles F.
Bellamy, Frederick B.
Bellamy, William
Beynon, Frederick H.
Brown, James
Bryant, Charles M.
Callard, Thomas J.
Campbell, Albert J.
Campbell, Herbert
Carney, John
Clarke, Thomas J.
Clifford, Frank
Cook, Alfred J.
Cooper, Anthony V.
Cotton, Ernest J.
Dallison, Francis H.
Digby, Edward
Dyke, Frederick
Elsworth, Sidney H.
Ennals, John
Healy, John T.
Herrick, Henry D.
Hester, James D.
Horton, Alfred E.
Hughes, Edward G.
Ironside, Alan S.
Lacey, Leonard
Lennon, William H.
Livesey, Stanley E.
Lucas, Arthur A.
Luck, James A.
Millington, Percy
Nixon, John W.
Ogilby, Bertram L.
Parsons, William G.
Prankard, Alfred C.
Quelch, Stephen J.
Roberts, Arthur B.
Sawbridge, George T.
Scott, James J.
Shadbolt, Robert
Sly, Herbert F.
Smith, Joseph H.
Snoad, Arthur
Squires, Ernest H.
Stapleton, Frank W.
Waterfield, Edwin W.
Williams, Bertie
Willmer, Harry W.
Withers, George E.
Yates, William M.

### GRADE I.
#### First Class.

Arthur, Edward
Ashworth, John D.
Ashworth, Richard
Bacon, Alfred J.
Badger, Edward A.
Baker, James W.
Barber, Herbert
Bateman, Henry L.
Beck, Harold
Bennett, Henry J.
Bevan, Leonard
Beveridge, James W.
Billingham, Arthur D.
Blythe, Eldred W.
Booth, William E.
Brooke, Edgar
Broomhall, Edward F.
Broomhall, William J.
Butterfield, John A.
Byrne, Edward T.
Canlett, Frederick R.
Canning, John
Channon, Percival J.
Christmas, Ernest V.
Church, Ernest H.
Clay, John B.
Comfort, Edgar E.
Cooper, George
Cooper, Samuel J.
Cottle, Ernest A.
Cronk, Leonard
Crowther, George B.
Cullen, John F.
Dadson, George H
Dadson, Nicholas W.
Darch, Reginald F. J.
Davis, Joseph F.
Davis, Samuel J.
Dicker-Jones, Thomas
Dieterichs, William
Dolan, William
Driver, Morris
Duncan, Clifford
Dyhouse, William
Edwards, George C.
Ellis, Edward A. S.
Evans, Edward
Evans, Louis
Fevyer, Ernest W.
Fletcher, Harold J.
Foy, William A.
Freakes, Alexander J.
Freeth, Henry A.
Fryer, Albert H.
Fryer, George E.
Gardener, Walter F. J.
Gaskell, John H.
Gibson, James W.
Gibson, Robert
Godley, Albert G.
Gould, John A.
Govey, James T.
Greenacre, John H.
Gregson, James
Hack, Sydney R.
Hadley, Edgar
Haley, Henry
Hallam, William T.
Harrod, Herbert
Harwood, Frederick F.
Hayward, Ernest W.
Hazell, Ernest R.
Hide, Edward
Holman, Frederick J.
Homersham, E. W.
Hood, John
Horwood, Henry G.
Howe, John S.
Isaac, Henry A.
Jacobs, Alfred F.
Janes, Robert C.
Jeffery, David W. T.
Jones, Arthur
Jones, Hugh
Jones, Thomas G.
Kaye, Elliott
Kimpton, Arthur W.
Knight, George H.
Langstreeth, Percy D.
Lilly, William
Lines, Arthur E.
Mabey, Francis A.
Malyn, Leonard
Marsh, James W.
Martin, George A.
Martin, Henry J.
Mead, Frederick W.
Millett, Thomas W.
Millner, Frederick
Mills, Albert H.
Mimmack, Tom
Monk, James J. T.
Morgan, Arthur
Morgan, Edward W.
Morrison, James
Muirhead, Thomas
Needle, Albert E.
North, George C.
Oliver, Frank
Orr, Graeme C.
Orr, Thomas
Owen, Joseph
Page, Alfred T.
Parker, Frederic C.
Pateman, Frederick C.
Perridge, Ed. C. W.
Perry, Thomas
Pile, Fred
Portsmore, Herbert
Potter, Sidney J.
Purkis, Hubert S.
Read, Frederick J.
Reeder, Sidney E.
Revett, Jack
Reynolds, Robert A.
Richards, Cyril
Rivers, Ernest
Roberts, Arthur
Roberts, Frank
Rooney, Patrick J.
Rowland, Arthur
Rowley, Walter
Rudge, John
Rudge, Tom
Rust, Joseph F.
Ruston, William C.
Sammons, Charles G.
Schreiner, Edwin H. C.
Seagrave, Thomas A.
Shepherd, Frank C.
Sheppard, Charles H.
Short, Alfred J.
Small, Howard D.
Smith, Ernest F.
Smith, Harry J. J.
Smith, Lionel
Smith, Noel S.
Snowdon, Thomas M.
Spencer, Alfred
Stainer, Austin
Stanley, Horace R.
Strickland, Cyril C.
Sturdy, Luke
Sturney, Charles
Summerhayes, F. G.
Sumner, Leonard G.
Taylor, Charles H.
Taylor, Frank G.
Taylor, Thomas E.
Taylor, William C.
Thomas, Arthur F.

Thorburn, R. D. V.
Thorn, Harry
Thrale, Geoffrey
Vernon, William A.
Waddington, Harold
Warby, Ernest H.
Ward, Ernest H.
Wardle, Thomas J.
Walker, Arthur T.
Webber, Wilfrid G.
West, Harry
Westworth, James K.
Wheeler, Ernest J.
White, Robert J.
Wicks, Ernest
Wilbraham, George H.
Williams, James R.
Williams, John
Wolfe, Thomas A.
Wood, Frederick W.
Woods, Alfred C.
Wooster, James S.
Young, Conrad
Young, Victor H.

**GRADE I.**

**Second Class.**

Abbott, Allan
Adams, Thomas E.
Allen, Frederick J.
Ashley, James H.
Atkins, William P.
Ball, Bernard T.
Barker, William
Barron, George E.
Bartlett, Thomas
Baxendale, Fred. J.
Bleach, George W.
Bouch, Walter
Brutnell, Leonard
Buckley, E. Alexander
Burroughs, George
Casey, Frank R.
Cattell, Herbert S.
Chapman, John H.
Chittenden, Henry W.
Clements, Ernest A.
Cook, Alfred T.
Cooper, Edward C.
Cross, John
Cuthbertson, F. W.
Cutler, Arthur H.
Dale, Harry
Davidson, Alex. N.
Day, Edward
Denton, Edward A.
Dunn, James W.
Ellison, Charles
Etherington, Joseph
Evans, Llewellyn
Faithfull, Cecil W.
Felton, Colin B.
Ford, Frederick R.
Gamblen, Henry W.
Gilding, Frederic
Glass, Henry F.
Goodall, Robert J.
Greaves, John
Green, Walter J.
Handover William H.
Harrison, Norman H.
Harrowell, George E.
Hastings, Bertram S.
Hayward, Henry
Hayward, Walter G.
Helyar, Ernest
Heuser, Frederick
Hitchcock, William A.
Hopkins, Frank J.
Hughes, J. A. E.
Humphries, A. W.
Humphries, Wm. H.
Hurley, Richard E.
Jackman, Frederick H.
Jarman, Alfred A.
Jobling, Walter
Kerry, Robert S. A.
Lambert, Thomas
Langford, Percy S.
Ley, Walter
Long, Arthur C.
Lord, William
Manwaring, Percy
Marsh, Thomas
Matthews, William E.
Moles, Harold
Moseley, William
Murphy, Frank
Naish, John T.
Nason, Albert M.
Niven, Guy
Nixon, Horace
Palmer, Bertram G.
Parry, George J.
Parsons, Stanley W.
Philpott, Patrick J.
Pickard, Alfred
Pierson, Henry W.
Price, Howard W.
Priest, Clarence E.
Purse, George H.
Redding, Frederick J.
Riley, James
Roberts, Albert
Robertson, Frank
Robson, George W.
Rooke, Edward
Sadler, John F.
Scanes, Leonard D.
Scott, Robert
Scrivener, Cyril R.
Shelton, Archibald C.
Simmonds, Robert
Smith, Bernard
Smith, Charles H.
Smith, George F.
Smith, Harold W.
Smith, Josiah W.
Southwick, John J.
Stannard, William S.
Stanswood, Fredk. B.
Stevenson, Edward
Stock, Arthur R.
Taylor, John K.
Telling, Thomas J.
Thomas, Harold F.
Tilbury, Ernest W.
Trimboy, Edward B.
Tuck, Percy
Tucker, Stanley A.
Tutton, Arthur
Twiss, Arthur
Vigor, John G.
Wallace, Wm. H. P.
Walton, John
White, Albert G.
White, Albert H.
White, Herbert L.
Williams, Alfred J.
Williams, Henry G.
Williamson, Harold
Wilson, Charles M.
Winslow, Albert G.
Woodrow, David M.
Wright, Charles T.

# THE WORKING FLUID OF INTERNAL-COMBUSTION ENGINES.

**Lecture by Mr. Dugald Clerk, D.Sc., F.R.S., M.Inst.C.E.**

At a Meeting of the Junior Institution of Engineers on Monday last week, Mr. DUGALD CLERK, D.Sc., F.R.S., M.Inst.C.E., delivered the second Gustave Canet lecture, taking for his subject "The Working Fluid of Internal-Combustion Engines." It was of considerable length, and was illustrated by a large number of diagrams. The following extracts will indicate its scope.

The lecturer began by pointing out that though the steam-engine in its various forms has been in successful practical operation for about 140 years, it cannot yet be said that knowledge is complete as to the physical properties of steam; accordingly, it is not surprising to find that still less is known of flame, which is the working fluid of all internal-combustion engines. The combined work, however, of English and Continental physicists and engineers has thrown much light upon the physical and chemical behaviour of flame, both within and outside the cylinder; and it is now possible to give an approximately accurate account of the leading phenomena of combustion, explosion, and expansion, so far as concerns the engineer. At the Leicester meeting of the British Association in 1907, a discussion took place between English and Continental engineers and physicists on the subject of combustion and flame; and, as the result, the Engineering Section of the British Association formed a Committee of physicists, chemists, and engineers in order to study the subject experimentally. He had had the honour of co-operating with other experimenters as a member of this Committee during the past six years. Many complicated phenomena had been studied, many new results obtained, and some facts had been determined with sufficient accuracy to to be useful to the engineer and inventor. In the present lecture he proposed to describe, as simply as possible, data which had been ascertained with reasonable certainty.

In order to give a direct practical application to the knowledge now at our disposal, Mr. Clerk reminded his audience first of the principal constants required in order to calculate thermal efficiencies and to allocate heat and other losses in the procedure within the cylinder during the operation of the ordinary four-stroke cycle or "Otto" engine. To do this, he considered a diagram of such an explosion or constant-volume engine in which he assumed that the whole supply of heat was added at constant volume, and

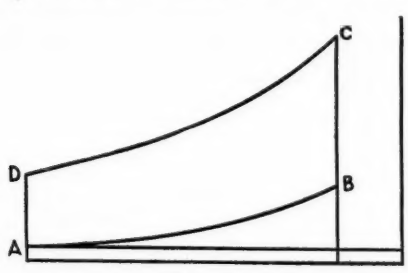



Fig. 1.

all that was discharged was discharged also at constant volume. Fig. 1 shows such a diagram. In it, the whole heat supply is assumed to be added on the explosion line B C at constant volume, and the heat is discharged on the line D A, also at constant volume. The total volume within the cylinder is taken as $v$, the volume of compression space as $v_c$. To learn the indicated thermal efficiency of an engine giving such a diagram, it is only necessary to know the heat value of the fuel in the charge within the cylinder per explosion and the heat equivalent of the work area A B C D. The indicated thermal efficiency is then the thermal equivalent of work area A B C D divided by the thermal units in the fuel supplied per stroke.

In good modern gas-engines, the indicated thermal efficiency calculated on the lower heat value of the fuel is about 0·35. To arrive at this value, it is only necessary to have an accurate diagram and an accurate measurement of the heat given to the engine charge per stroke. Neither temperature nor specific heat constants are required. It is not sufficient, however, to know only the actual thermal efficiency of the engine; it is also necessary to learn the possible thermal efficiency with all losses suppressed. For this purpose there must be known the specific heat of the working fluid at all temperatures within the working range. From this can be calculated the ideal efficiency for any given circumstances of compression and expansion, which efficiency would be given in the event of the working fluid being used in exact accordance with the conditions of the cycle, without either heat loss from the fluid to the cylinder or heat gain from the cylinder to the fluid. The specific heat constants, if known, enable an ideal diagram to be drawn, and comparison between the ideal and the actual diagram allows the distribution of the various heat losses to be found.

To enable an actual diagram of an engine to be dealt with in this way, it is necessary to know four sets of facts in regard to the working fluid: (1) Temperatures of the working fluid at the four points on the diagram; (2) the total energy of the working fluid at each of these points; (3) the loss of energy of the working fluid during the rise of temperature from B to C; (4) the proportion of combustion completed at the point C and the proportion of further combustion, if any, between points C and D, and also the proportion of combustion completed at the point D. All these matters have been investigated by members of the Gaseous Explosions Committee of the British Association, and some information is available. The extent of it was shown by the lecturer by considering the four heads indicated.

Taking the first head, Mr. Clerk explained that the diagram is assumed to be an actual one taken from any four-stroke cycle engine, so arranged that heat is added entirely at constant volume $v_c$, while the exhaust heat is abstracted also at constant volume $v$. In reasoning of this kind, it is usual to assume that the same working fluid is used throughout successive cycles, and the only changes that occur are those due to the addition of heat at the compression end and the abstraction of heat at the exhaust end. As a matter of fact, in actual engines the charge is renewed at each stroke, and the discharged heat got rid of by discharging the products of combustion. The rate of explosion, too, is not definite, so that heat is never added entirely at constant volume, and the exhaust valve has a lead, so that the square end of the diagram, as shown at D A, is not that of an ordinary engine. If the absolute temperature of the working fluid be known at any one of the four points, then, applying the usual laws of gases, from the absolute pressures and volumes, the temperatures at the other points can be readily calculated after allowing for change of volume due to chemical action during the explosion period B C.

Professors Calendar and Dalby succeeded in applying the platinum resistance thermometer to the determination of both suction and compression temperatures by the use of an ingenious attachment to the charge inlet-valve of a four-cycle engine. Calculating from these temperature values, they found with a rich mixture a flame temperature at the point C of 2500° C., the mixture drawn into the engine being 1 of gas to 5·8 of air. With 1 of

gas to 7·1 of air, the temperature at C is nearly 2250° C. The exhaust temperature, at D, in the case of the rich mixture was 870° C., and in the poorer mixture 800° C. The experiments are being continued with improved apparatus. Professor Coker has also attacked the problem of the exact measurement of the four required temperatures; but instead of using a platinum resistance thermometer, he has adopted thermo-electric couples of platinum iridium and platinum rodium. In some experiments made last year with a small "National" gas-engine running with consecutive ignitions, he came to the conclusion that at three-quarters load a temperature of 1800° C. was reached at a distance of 0·5 inch from the walls. The mixture drawn into the cylinder contained 1 of gas to 7·35 of air. With a rich mixture such as that used by Calendar and Dalby, Professor Coker found a maximum explosion temperature of 2250° C.; but the usual highest temperature at C for ordinary mixtures used in the engine varied between 1830° and 1950° C. Professor Hopkinson has also made determinations of temperature during the suction and compression periods by means of platinum resistance thermometers. Dr. Clerk said that from the important work of the investigators named our knowledge of the actual temperatures attained in the working fluid is much more accurate. Further tests are being made, however, with apparatus improved as the result of experience; and in a few years it will be possible to give a much more accurate account of the gas-engine diagram under this head.

The direct thermometric measurements within the cylinder involve difficult and laborious work; and the lecturer described a method in which there is no complication due to hot gases being left in the cylinder—the temperature of the whole charge being measured by repeatedly passing over the thermometer. He calculated the temperatures of the points A, B, C, and D in this manner; and fig. 2 is a diagram taken by an optical indicator with

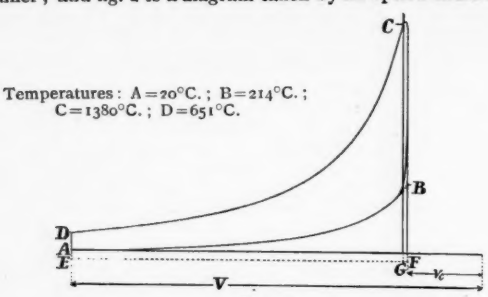



Fig. 2.

all the necessary data. It will be seen that the temperatures are 20° C., 214° C., 1380° C., and 651° C. This method is stated to give good results; but it is only available where single charges are studied. It, however, allows of great accuracy in the determination both of the mixture used and the temperatures attained.

Mr. Clerk then proceeded to discuss together, in great detail, the matters dealt with under the other three headings. He said it was evident therefrom that the heat loss to the cylinder walls is much less than is popularly supposed in engines of modern design. It is often believed by inventors that one-half of the whole heat of the fuel passes away through the walls; and many schemes for working with red-hot walls have been, and indeed are sometimes yet, proposed, under the idea that a great increase in thermal efficiency is possible by saving wall-loss. As a matter of fact, only a comparatively small increase in thermal efficiency is possible even if the whole of the wall-loss could be prevented.

Experiments carried out by the lecturer made it possible to estimate roughly the heat loss on the explosion line in an ordinary gas-engine, using the most economical mixture and a maximum temperature of about 1800° C. With time of explosion 1-30th of a second, under ordinary compression, a 3 per cent. loss may be expected. Radiation loss has been found to increase very rapidly with temperature. The loss is proportional approximately to the fourth power of the temperature difference from the walls. This limits the temperature attainable in gaseous explosions during gas-engine working conditions; and dissociation has but little effect at temperatures about 2000° C. Radiation also increases with increase in the dimensions of the containing vessel.

In drawing his lecture to a close, Mr. Clerk said: I have now discussed in an imperfect manner some points of importance which have been the subject of much investigation and study. A large part of the work done has been devoted to the consideration of the internal-combustion engine balance-sheet; and a practical man may feel inclined to ask in what way such minute consideration aids in improving the motor. Some practical men have gone so far as to say that gas-engine designers have brought internal combustion engines to their present state of efficiency without any aid from scientific theory, and that no knowledge of chemical and physical constants is really necessary to continue the progress on the lines which have been so far successful. In my opinion, practical men very greatly underrate their indebtedness to theory. They do this partly because the men of to-day have been brought up with fairly accurate notions on the theoretical side of such motors; and it is necessary to go back to about 1876 to understand the full measure of ignorance of both engineers and physicists on this subject. At that time, the compression ratio was supposed to have nothing to do with the success of the modern gas-engine. The absurd theory prevailed, even among highly scientific men, that slow combustion, however obtained, produced economy. The emergence of even the relatively imperfect theory of the gas-engine, which adopted the use of air of constant specific heat as a basis for calculation, provided long ago a clearly indicated line showing that progress in thermal efficiency could be made in a certain direction only. The air-standard diagram, together with an early study of some properties of gaseous explosions as far back as 1885, clearly demonstrated two points: (1) That, within wide limits, thermal efficiency could be increased by increasing compression; (2) that in the use of the "Otto" or constant-volume cycle higher temperatures do not give higher thermal efficiencies. On the contrary, for a given expansion, the lower the maximum temperature, the less the heat loss and the greater the thermal efficiency. With these simple indications, the indicated thermal efficiency was increased from 15 to about 30 per cent. in 25 years. In practice, however, many difficulties appeared, and the air standard did not give information as to how near practice approached to the ideal efficiency for the particular working fluid. It therefore became necessary to determine actual specific heat; and from this work it has been proved that reduction of temperature improves efficiency in two ways—first, by reducing heat loss; and, secondly, by increasing the possible output for a given expansion because of a lower specific heat. Engineers now know, with fair accuracy, that a modern gas-engine indicates about 88 per cent. of what it could possibly do without any heat loss whatever, having regard to the nature of the working fluid used.

Many of the experiments that I have described also show very clearly the reason for practical difficulties in the larger-cylinder engines. The determination of the heat loss at different parts of the stroke proves conclusively that in an ordinary engine the rate of heat flow at the combustion chamber end per unit of time and surface was often more than six times that prevailing at the outer end of the stroke. This points clearly to simplified construction in engines, dispensing entirely with complicated castings and double walls and cooling from the interior by water-jet possibly in the manner proposed and tried by Professor Hopkinson. A knowledge of the nature of flame and the rate of flow under different conditions at different parts of the cylinder has aided the practical engineer very greatly in overcoming difficulties of construction. In the absence of this knowledge, it would be impossible to propose any line of work which would avoid cracked cylinders and combustion chambers, which even now are too common with cylinders of large dimensions.

Apart from suggesting mechanical alterations in engine construction, a knowledge of the working fluid enables us to see in what way to obtain the highest mean pressures and thermal efficiencies with the lowest temperature and pressure stresses. It shows, for example, that it is better for good working to use a dense working fluid at a lower maximum temperature than a less dense fluid at a higher maximum temperature. This knowledge has led to attempts such as air and exhaust supercompression, which have been applied to some extent, and have been useful in providing easier conditions of temperature and pressure stress. Undoubtedly further knowledge of these things will enable the remaining difficulties to be met in an efficient manner.

Knowledge of the nature of the working fluid, too, has shown how to control such internal-combustion engine troubles as are due to pre-ignition. Experiments with modified working fluid produced by the addition of carbonic acid and nitrogen to the charge have shown very clearly that even coke-oven gases having high percentages of hydrogen can be safely used in engines of considerable cylinder diameter. Pre-ignitions in large-cylinder engines are known to be dangerous, especially with coke-oven gas, and knowledge of the working fluid shows how to overcome the danger entirely without diminishing the power of the engine.

Considering again the question of thermal efficiency, our present knowledge of the working fluid points conclusively to the fact that further improvement may be obtained by means of the regenerator in various forms. Theoretically, regeneration applied to the working fluid itself would give the highest efficiency values; practically, so far the only regenerator employed has been the steam regenerator, using the waste heat from the engine. The increasing efficiency of the internal-combustion engine has put great pressure upon steam-engine builders, and undoubtedly recent steam-turbine efficiencies have attained such figures that it becomes necessary for the gas-engine designer to attempt further economies in order to keep ahead of his steam rival. This he can only do by exact knowledge of his heat losses and properties of his working fluid. The success of the steam-turbine, too, has applied great pressure to the gas-engine designer in the direction of dispensing with cylinder and piston. No one has yet succeeded in producing a successful gas-turbine; but many methods of operation suggest themselves to the engineer familiar with his working fluid. Progress here is possible in several directions, and one is that which is pointed out by the success of Mr. Humphrey's gas-pump. So long as the engineer adheres to nothing but the old cycles of operation copied by designer after designer from the older inventors, he may get along without much knowledge of the working fluid. But it is to be hoped that new cycles will be discovered, and that the high thermal efficiencies possible by internal combustion may be combined with the great mechanical advantages of the rotary turbine in some manner which will enable the large gas-engine to fully rival the steam-turbine in mechanical power and dimensions, as it at present more than rivals it in economy and thermal efficiency.

# WAVERLEY ASSOCIATION OF GAS MANAGERS.

**Annual Meeting in Edinburgh, July 4.**

Address by THOMAS BLACK, Engineer and Manager of the Coldstream Gas-Works.

The President, after thanking the members for electing him, referred to the loss that had been sustained by the death of Mr. John M'Laren, of Duns, who was President of the Association in 1898. Though just 52 years of age, Mr. M'Laren was, he said, one of the oldest members of the Association; and his untimely death was a matter of sincere regret to all who knew him—particularly to the members of the Waverley Association. The President then proceeded as follows.

The manifold nature of his duties nowadays renders the calling of the gas manager more and more exacting. A generation ago, when gas held a monopoly of its class of business, beyond the periodical inspection of its meters, the then gas manager's responsibility practically ceased when his gas had reached the holders. But in these days of competition he has to see his commodity consumed, and that to the best advantage, or he would very soon find a goodly portion of his business being filched from him by competitors.

### THE PRICE OF COAL.

The serious rise in the price of coal last year—a rise further augmented since then—is a matter of much concern to those connected with our industry. An advance of 20 to 30 per cent. in the cost of raw materials of most businesses must of necessity considerably add to the cost of producing the manufactured article. In only a few instances, however, it is pleasing to note, have gas companies found it necessary to increase their prices. I think that we can congratulate ourselves upon the fact that the boom which our industry at present enjoys compensates to a large extent for this increased cost of coals. Our industry was never in a more flourishing state, nor was there ever a time when we could face the future with more confidence, than we can to-day.

### THE SMOKE PROBLEM.

Judging from the various needs for which our commodity is now adopted, and the greatly increasing popularity of up-to-date gas appliances, the age we live in might very appropriately be termed "the gas age." The signs of the times all point to the probability that in the near future the use of coal in the average house will be the exception rather than the rule, especially in the larger centres of population, where too much cannot be said against the evil consequences resulting from the consumption of so much crude fuel in countless thousands of fireplaces. Those of us who live in small towns have little or no experience of the smoke nuisance; but its detrimental effects upon the conditions of existence in larger places are being recognized with increasing vividness every day, and call for more rigid dealings with this great evil. There can be no doubt that the solution of this problem lies to a large extent in the hands of the gas industry.

Not only those connected with our profession realize this, but the "man in the street" is also gradually being awakened to the fact. A few words may well be put forward here in praise of the recent smoke abatement exhibitions, as they have been instrumental in attracting the attention of the general public in a very special way to the great benefits dependent upon the use of the latest forms of gas appliances; and, by so doing, they have contributed in no small measure towards the flourishing state of our industry to-day. The same laudable expressions can even more strongly be voiced with regard to the now established British Commercial Gas Association. The formation of this Association is a matter of much gratification to everyone connected with our industry, and its excellent work in giving widespread publicity to the claims of gas, through the medium of the general Press, must assist our business to a very considerable extent. The Association thoroughly commends itself to, and deserves the unstinted support of, every gas company and corporation in the country.

### DOMESTIC COOKING AND HEATING APPLIANCES.

What a radical change has lately taken place in the construction of gas-fires! So much has recently been published in praise of the modern fire, that it cannot be necessary for me to enumerate its virtues here; but I feel I must just mention the same on this occasion, forming, as it does, such a vital part of our business nowadays—and a part that must command our increasing attention in the future. The old prejudice against gas-fires is now practically dead; and it is very gratifying to the gas engineers of to-day to know that the medical authorities fully appreciate the value of the modern gas-fire, and are, consequently, among the chief advocates for its use. There is no question that the adverse critics had a lot to justify their condemnation of the earlier types of gas-fires; but the thoroughly hygienic nature of its construction, coupled with its great efficiency, stamp the modern gas-fire as an article that must take its place as an absolute necessity in the well-regulated house of the future.

The almost universal use of the gas-cooker justifies the assertion here that this is the most satisfactory method of cooking to-day. The gas cooking-stove, as we have it, reached its high standard a number of years ago; and the excellence of its manufacture seems to leave little in the way of improvement that could even be suggested. Also, when the housewife sees that her cooker is kept clean, and in proper repair, seldom, if ever, do any complaints reach the gas office. There is one point, though, that I would draw attention to—the great necessity for periodical examination of the ovens, in order to see that there is free draught. Unless the products of combustion, &c., have a clear exit from the gas-oven, the result is not only inefficiency so far as the cooker is concerned, but it becomes a source of danger to the user.

I have had this brought rather forcibly to my notice since I went to Coldstream, as on two occasions there have occurred nasty explosions, in one of which a considerable amount of damage was done. Upon investigation, I found that the causes of these explosions were the same. The cookers were of similar make, a pattern in which the passage across the top, through which the products of combustion pass from the oven to the flue, is exceptionally narrow, and iron lined. The moist fumes from the oven, in passing through this, caused scaly deposits to gather therein, which gradually increased as time went on, and almost wholly blocked the passage, with the grievous results mentioned. In fact, I was informed by one of the users that for some time previous she had to keep the door of the oven slightly open when using it, as, if shut, the burners would at times not remain alight. In some patterns of gas-cookers, this part cannot be examined without taking a considerable portion of the cooker to pieces. This I consider a drawback, especially in the type referred to, where it is narrow. I daresay that quite 90 per cent. of gas companies give gas-ovens proper attention; but should my remarks attract the attention of the remaining 10 per cent., who, it may be, neglect this precaution, I tender this as my excuse for bringing the matter to your notice.

A branch of our industry that deserves to be recognized is that of ironing by gas. So far as my experience of this is concerned, I find the apparatus for ironing purposes which commands most favour is that consisting of two irons and bunsen stand—one iron being in use while the other is heating. Though the amount of gas required is small, I believe in strongly advocating the claims of this exceedingly handy article; for the simple reason that every apparatus of the kind introduced into domestic use is a further inducement for housewives to do without coal-fires. It is only when consumers realize that gas can be adopted in any and every way, and for all purposes for which coal is used, that the chance of gas superseding coal for all domestic uses will be vouchsafed.

The household coal-range will undoubtedly be the last and greatest set-back to the time when coal may ultimately be displaced from domestic service—this having so long provided the necessary hot water supply. Gas water-heaters and geysers, however, are rapidly gaining popularity for this purpose. The more I have to do with the installation of geysers, the more I am convinced that a great future lies before these most useful articles; and though their installation necessitates the fixing of a 10-light meter and ¾-inch service and supply-pipe, at the least, in these days of heating, cooking, and inverted lighting, the cost of displacing a ½-inch, or, sometimes, smaller service-pipe by the larger size is well-spent money, improving, as it does, the supply for other purposes.

### LIGHTING CONSIDERATIONS.

Gas for lighting has now had a long innings; and despite the arguments usually advanced in support of electricity, the modern inverted gas-burner maintains its great popularity for ordinary use. The hard facts of its being so much cheaper, more reliable, and, most of all, a much better light, generally tell in favour of gas. In this connection, however, I would like to mention that it behoves us managers of small works to experiment with different kinds of burners till we find out the class that is best adapted for the quality of our gas, and advise the use of these patterns to our consumers. It is not an easy matter for the small works manager to produce, from our Scotch coals alone, the lower-grade gas that is practically the general quality sold by larger concerns. The illuminating power of his gas is seldom, if ever, below 20 candles, and it is often much higher—especially where lime is exclusively used for purification. In these cases, to get the best results from inverted burners, his policy must be to keep up the supply pressure, and induce the consumers to see that the air-inlets to the burners are kept fully open. Some patterns of burners are more suitable for gas that is richer than the average commodity.

The richer gas requires to be consumed at a comparatively higher pressure than is generally needed, as it is only in this way that the requisite amount of air required to ensure complete combustion can be drawn in by the injector effect of the gas-adjuster. The richer the gas, the more vital is the necessity for keeping up the pressure, if blackened mantles, &c., are to be avoided. At any rate, this is my experience in Coldstream, where I also find it almost impossible for full lighting value to be derived if the burner in use be without a gas-adjuster. Personally, I think it is a pity that burners without these adjusters are on the market, where a comparatively rich gas is concerned.

Before leaving this matter, I might also mention the great

necessity for ensuring that an adequate pressure of gas is getting forward to the burner. It is no uncommon experience to find a ⅜-inch, and sometimes even ¼-inch, pipe, doing duty as the main supply from the meter in houses where quite a number of lights are in use. The latter size of compo. piping, I am tempted to add, might, in most circumstances, be exempted from gas companies' service.

### VERTICAL RETORTS.

By far the most interesting subject that is claiming the attention of gas managers to-day is that of vertical retorts. Within the last year or two, this system has been brought to a high standard of efficiency; and it is now certain that we are at the commencement of a pronounced change in the carbonization of coal. Types of these settings have, with much success, been installed in various works; and it looks highly probable that at no distant date horizontal retorts will give place to this very desirable method of carbonization, in much smaller works than was anticipated a year or two ago. They have much to recommend their adoption; and though gas companies which are at present well furnished with the older systems might scarcely be justified in displacing them by this latest method, they can, perhaps with advantage, afford to await further improvements that will, no doubt, develop within the next few years. Those who must consider extensions of benches in the immediate future will, however, require to give the utmost attention to the advisability of putting down vertical plant. Not having any experience of this subject, I must not speak further here.

### THE COLDSTREAM GAS COMPANY.

I will now give you a few details of the business of the Coldstream New Gaslight Company. Though a small town, Coldstream has the distinction of being the second place in Scotland—if not the first—to have a gas-works. I am sorry I have not got any definite information as to whether or not the works were there previous to the inception of the first Glasgow Gas-Works in 1817. I have seen it recorded that the first gas-works in Scotland were erected in Coldstream; but the earliest reliable local data that I have been able to find which makes mention of the gas-works being already in existence is dated January, 1821. Fully four years ago I went there; and I am glad to say that during this time the output of gas has increased over 50 per cent., though I cannot lay claim to having tried anything beyond the most elementary methods to achieve this. At the end of my first year as Manager, my Directors reduced the price of gas by 10d. per 1000 cubic feet. This stimulated me very much in canvassing for new customers. It also had the effect of making the consumers we already had less sparing in their use of gas.

Coldstream is not a growing town, so we could not look for any development of our business from this source—like many places that are growing rapidly. However, there were a goodly number of people without supplies who, I found, would gladly use gas, provided the expense connected with the installation did not fall upon themselves. I therefore interviewed the landlords or house agents of the various properties, and offered to fit up all piping, &c., at the expense of the Gas Company—not only from the mains to the meters, but throughout the houses as well—on condition that the owners paid for the brackets only. Now, in the majority of cases, as this meant just the outlay of a few shillings for them, I scarcely met with a refusal. The tenants, I found, were quite willing to purchase the necessary incandescent burners. I also received numerous orders for cookers, ranges, hot-plates, and scores of boiling rings, &c. You will notice from this that we do not fit in slot-installations, like some larger companies, and charge an additional rate for gas over the ordinary price. Our price through both classes of meters is the same. At the end of our financial year, 1911, our increased output was about 30 per cent. over that of the preceding year; and this has been further augmented since then to the extent already mentioned.

Latterly, I have tried pushing the sales of fires, geysers, and appliances for ironing; and despite the high price of the gas I have been very successful. Everything supplied as above is provided by the Company at cost price, and fitted up free. Cookers are rented out at a small annual charge, and, of course, are also fixed free. Cookers, whether belonging to consumers themselves or rented out, are maintained in proper repair by the Company, who also provide the usual cooker requisites without charge.

Coldstream Railway Station is situated about 2 miles from the town, and the works are in the town. We are also a good distance from coal supplies; so what with railway dues and cartage, our coal works out at rather a stiff price per ton. The same disadvantages affect the price we get for tar and liquor. Against this, coke commands a ready market at 13s. 4d. per ton, and the spent lime is bought up by local farmers at a price averaging about 3s. 6d. per ton at the works. I may add that the very limited quantity of spent lime we have for disposal by no means represents the whole of this commodity used around the district, as large quantities are brought into the station from other sources. The price we get for spent lime accounts for my continuing its use for purification. A few of my gas manager friends advise me to stick to lime, others again urge me to adopt oxide of iron. Perhaps this might be discussed, as in spite of the many advantages offered by oxide, I know of not a few who still hold divided opinions on this matter.

### PROPOSED COMMERCIAL SECTION.

Before closing, I would briefly refer to the proposed establishment of a Commercial Section in connection with our Association. Mr. Napier put the claims of such a section very plainly before us last year. In the interim, our Committee have not been idle; and the matter has been freely discussed at Committee meetings, at which it was felt advisable to ascertain the opinion of each of the members separately. The Secretary was therefore requested to send circulars to this effect, to which a considerable number of favourable replies were received, though one or two expressed doubt as to the success of the scheme. We have the opportunity, here and now, to thoroughly investigate the question; and I venture to hope that, if considered practicable, a decided course to pursue may to-day be clearly defined, and that, before the close of our meeting, the foundation of the section may be laid.

### DISCUSSION.

Mr. JAMES M'LEOD (Greenock) referred to the cheery note of optimism that ran through the address. Taking up some of the points that had been referred to, he declared that they were just on the threshold of a great advance in the matter of gas-fires. One difficulty that faced some of the managers was in the case where there was a request for several gas-fires, which involved practically a revolution of the whole gas-piping in the house. This was a very serious item; and it caused one to wonder if the consumption of gas was really going to pay them for the necessary outlay on the change of the piping. However, there were very many instances in which a gas-fire could be put in with a minimum of trouble; and in these cases they must push ahead, and try to get it introduced. On the question of free fires, he thought they were in a different category from cookers, in respect that they were of more intermittent use. The question of vertical retorts was interesting to all of them, and applied to the very smallest, as well as to the largest, works—in fact, it was questionable whether they were not of more advantage to the smaller undertakings than to the larger ones. There were already several very small vertical retort installations in use; and the results obtained were excellent. He pointed out the good work done by the British Commercial Gas Association, and mentioned that, in his own case, a number of inquiries had come through the Association, and that in every instance he had been enabled to do business.

Mr. WILLIAM BLAIR (Helensburgh) gave practical testimony to the working of vertical retorts. It was two years ago that day, he said, since they started making the whole of their gas at Helensburgh in this way; and, as far as he could see, there was little or no deterioration in them. There was a big future before vertical retorts. They had been so successful at Helensburgh that they were able to sell gas at a very satisfactory figure. During the past year, they had produced from a ton of coal 11,400 cubic feet. It might be that the liquor would make 71 gallons per ton of coal carbonized. Coke sold was 9·71 cwt.—and this in a dry state, with 20 per cent. less moisture than ordinary horizontal retort coke. This, he thought, said a great deal for the system. He believed that at some of the works where they could be fully occupied, the labour costs could be brought down to about 6d. per ton of coal carbonized. In his own case, the cost was about 2s. 6d. per ton; and they had brought it down now to 1s. 6d., which included all labour. It was not possible, he thought, for a small place to get to a lower figure, though they could get down to 9d. per ton in his own case when at their maximum make in November, December, and January. The small amount of space required was a point in favour of the vertical retort; the labour conditions were easier; and they certainly obtained a large amount of gas for the coal used. His original estimate of these retorts had been fully verified by their two years' experience. Turning to the demand for gas for cooking and heating, he thought these were the lines on which they had to look for increased consumption in the future. In his own case, the sales of gas were growing annually from the use of fires and cookers. They did not give anything free, but supplied at the lowest cost possible.

Mr. HENRY O'CONNOR (Edinburgh), referring to the remark made by Mr. M'Leod on the question of piping, said he found that in most cases people were inclined to increase the size of the piping throughout the house, rather than lay pipes direct from the meter to the stove. From his own experience, he found it was far better to fix a complete set of pipes to deliver gas to stoves. It was almost impossible to lay pipes of such size and proportions as would serve for stoves and lighting at the same time, without making considerable variation at the ordinary burner when the stove was turned on or off. This question of pressure at the burner was a most important one. When a great many of the upright burners were installed in Edinburgh, they were specially made for rich gas, and had large air-holes. In going about now, it was not unusual for him to see several matches inserted to reduce the amount of air getting in. Of course, the modern burner had an air-adjuster as well as a gas-adjuster; and therefore these matches would not be required; but it was necessary that gas managers should find out what burners suited their own kind of gas. In this connection, he mentioned that burners suitable for Edinburgh were found to be giving too little air when they were tried in Glasgow.

Mr. R. W. COWIE (Dalkeith) asserted, from his own experience, that the gas-fitters did not give the same attention to the fixing of fires as gas managers would do, and once the fire was fixed and the account paid, they did not care twopence what happened. He had had occasion to re-connect and refit gas-fires that had been fixed by tradesmen, and paid for by consumers. Having remarked that he always made a point of taking a special

pipe from the cooker to the meter, he stated that the water from a new source of supply which had been introduced in Dalkeith threatened to bring disaster to every boiler in the town; and he was inclined to think it would be a great convenience if cast-iron boilers were used in preference to the copper type, which had to be sent back to the makers to be put right. He concluded by suggesting that it was time to get the Commercial Section agoing, and expressed a desire to move accordingly, if in order.

Mr. J. RICHMOND (Penicuik) alluded to the difficulty some managers had in moving in the matter of cookers and heaters, owing to the plea of directors that they had no money for them. With the experience of ten years with a company who kept the fitting in their own hands, he must certainly say that it was to the advantage of any company to fit gas-fires free. After all, it did not take very much interest to pay 10 per cent. on the sum of £5 which, on the average, each installation might involve. He confessed to being rather an adverse critic of vertical retorts, and suggested that at large works—such as those in London—they were not going in for them very much. The question as between oxide and lime was, he thought, very much one of local conditions. He had no doubt that lime was the superior purifying agent; but oxide had a considerable advantage in the matter of nuisance at the works, and at the same time its economy was great where there was a market for the spent material.

Mr. A. MACKENZIE (of Messrs. Alder and Mackay, Edinburgh) remarked that those who had seen the high-pressure lighting in London must admit there was a good deal to be done in poor old Scotland.

Mr. DAVID VASS (Perth) thought that the Waverley district was quite strong enough to have a Commercial Section, and that they could find time for the three or four meetings in the year which would be necessary. He considered the price the Chairman had spoken of as being received for lime as very much under value; and a Commercial Section would bring this out. He went on to say that, in the development of gas appliances, Perth was one of the go-ahead places. In support of this contention, he mentioned that about 80 per cent. of the consumers had gas-irons. They found these one of their best-paying articles. All domestic appliances were given free—that was, they were fitted free, and no rent was charged, on the understanding that they consumed a certain amount of gas. For every 10s. of cost, they required a guarantee of 1000 cubic feet. His practice with regard to the piping was to run it from the meter to the gas fires and cookers, except in the case of small things, such as boiling-rings and sets of irons.

Mr. W. S. EASSON (Jedburgh) also testified to the splendid work of the British Commercial Gas Association, as borne out in his own case by inquiries from half-a-dozen clients. While fully recognizing the success of gas-fires, he pointed out that they must not forget the price of gas; and where they were working with gas at 4s. or 5s. per 1000 cubic feet, economy must be studied. He questioned very much whether it paid to put in cheap cookers, and suggested that the difficulty of gas pressure raised by Mr. O'Connor was met by governors on the market which supplied a uniform pressure. In the competition with electric light, he was glad to say they were more than holding their own. Gas had the advantage of combining heat with light.

Mr. JOHN MACMILLAN (Lasswade) said that, as the result of an exhibition of appliances about a year ago, his undertaking had increased their consumption about 12 per cent. With regard to the lime question, they had to pay 10d. a ton to get the stuff carted away. The matter did not lie in the quality of the spent lime, but upon whether the land of the farmer was adapted for it.

Mr. SCOTT (of Messrs. Alder and Mackay) made a few remarks with regard to the question of uniform pressure.

Mr. H. RUTHERFORD (Inverkeithing) also made a brief contribution to the discussion.

Mr. PETER BLAIR (Haddington) spoke in support of the proposed Commercial Section.

Mr. D. MACFIE (Edinburgh), after pointing out that Mr. Black was in the unique position of having his gas-works in Scotland and having to cart his coal from England, expressed the opinion that, as time went on, it would be absolutely essential that every consumer should have a governor at the meter. But a governor at the meter was of no use unless the pipes were sufficient.

The PRESIDENT, replying to the discussion, stated that in nine cases out of ten in Coldstream they provided a new meter with a gas-fire, and that the burners there were of no use at all without adjusters. He experimented with various kinds of burners, and then he advised the plumbers as to stocking.

## Herr Körting on Gasholders—A Correction.

In connection with the translation published in our columns last week of the lecture delivered by Herr Körting to the German Association at Strassburg, it has been pointed out to us that two errors were allowed to pass on page 40. Owing to a mistake in converting metric measures into English units, 28 mm. is given as 0·09 inch, the correct equivalent being, of course, about 1·09 inches. In section 12 of the same column, the equivalents of 2½ and 4 mm. should be 0·098 and 0·156 inch respectively, not 0·008 and 0·01 inch as given. While regretting that such errors should have occurred in the conversions, we trust that our readers who were interested in the subject will have been guided by the sense, and have corrected the mistakes for themselves from the metric figures, which were also given in the text.

# REMOVAL OF CARBON BISULPHIDE FROM GAS.

By Professor KNOEVENAGEL, of Heidelberg.

**[Abstract Translation of a Paper read at the Meeting of the German Association at Strassburg.]**

The numerous attempts which have been made to remove from coal gas the sulphur compounds which remain in it after purification by bog iron ore have hitherto not led to very satisfactory results. This is partly due to the nature of the compounds, and partly to the small amount in which they occur in gas made from selected gas coal. The quantity present ranges from 13 to 65 grains (and over) of sulphur per 100 cubic feet of gas, and depends primarily on the proportion of sulphur in the coal carbonized; but it is also affected by (1) whether the sulphur is in organic or inorganic combination in the coal, (2) the heat of carbonization and the extent to which the gas is superheated in the retorts, and (3) probably the ash contained in the coal, which by catalytic action may affect the formation of the sulphur compounds. It is generally accepted that of the sulphur compounds other than sulphuretted hydrogen in coal gas, four-fifths to six-sevenths consists of carbon bisulphide. Other compounds that have been detected include carbon oxysulphide, ethyl, and methyl-mercaptan, di-ethyl and di-methyl sulphide, and thiophene and its homologues.

The compounds might conceivably be extracted mechanically by washing or absorption; but otherwise their chief constituent, carbon bisulphide, must be acted upon chemically so that it is either combined or decomposed. But the extraction in any case must not be a costly process. It is, however, eminently desirable, in view of the large quantities of coal gas which are now used for cooking and heating purposes. According to Albrecht, also, the carbon bisulphide appears to cause rapid destruction of the membranes of dry gas-meters. According to Pettenkofer, 0·008 per cent. by volume of sulphurous acid in the air, corresponding with about 30 grains of sulphur per 100 cubic feet of gas, is not objectionable. Samtleben points out that sulphurous acid can only be detected by the smell when there are considerably less than 100 volumes of air to 1 volume of sulphurous acid. There is no doubt, however, that the metal parts of burners and the glass of chimneys are strongly attacked by the products of combustion of gas containing much sulphur. The iron of gas-engines also becomes corroded; and experiments at the Waldhof Cellulose Works, near Mannheim, have proved that aluminium is rapidly attacked by sulphurous acid. In regard to the sulphur compounds in other industrial gases, it may be mentioned that Emil Fischer recommends that they should be removed from hydrogen which is to be used for the hydrogenation or hardening of fats.

As to existing processes for the extraction of carbon bisulphide, there is, in addition to the old lime process, the aniline process of Pippig and Trachmann, the velocity of action of which has been greatly increased by the plan of Mayer and Fehlmann, of adding metallic oxides—such as bog iron ore—to the aniline. The lime process, when properly worked, reduces the sulphur in the gas to 4½ to 9 grains per 100 cubic feet. The formation of cellulose xanthogenate by the action of carbon bisulphide on alkalized cellulose is a reaction—discovered by Cross, Beven, and Beadle, in 1892—which appears specially adapted for application in the removal of carbon bisulphide from coal gas. It takes place to the full extent in the course of a few hours at ordinary temperatures. Giving cellulose the formula $C_6H_{10}O_5$ (of which it is an unknown multiple), the reaction may be written thus—

$$C_6H_{10}O_5 + NaOH + CS_2 = C\begin{cases} O\,(C_6H_9O_4) \\ =S \\ SNa \end{cases} + H_2O.$$

This cellulose xanthogenate forms a highly viscous aqueous solution, and on this account was called "viscose" by its discoverers. Double as much soda as the formula indicates is used in its formation; and a portion of the soda reacts with carbon bisulphide to form sodium thiocarbonate, thus—

$$3CS_2 + 6NaOH = Na_2CO_3 + 2Na_2CS_3 + 3H_2O.$$

An excess of soda is also desirable, because certain forms of the xanthogenate are insoluble except in alkali. The cellulose xanthogenate is not stable, but even at ordinary temperatures forms polycellulose xanthogenates through the splitting off of CS – SNa residues. As the complexity of the xanthogenate molecule thus increases, the compound becomes less readily soluble. The transition to the polycellulose compounds is known as the ripening of the viscose, and the ripe products form the basis of artificial silk. The cellulose xanthogenate in the undissolved state apparently undergoes the changes which its solutions undergo in artificial silk factories, culminating in the formation of hydrated celluloses, which dissolve in formic acid and form formylcellulose, which constitutes non-flammable celluloid.

Experiments, made at the author's suggestion by Dr. J. Reis, have proved that alkalized cellulose is capable of extracting the small quantities of carbon bisulphide from coal gas, provided the carbonic acid is first removed. In these laboratory trials, the gas used was made from English coal, and the carbonic acid was abstracted by lime, soda-lime, asbestos saturated with 50 per cent. soda lye, or granulated potash. Caustic lime dries the gas, and thereby the alkalized cellulose, which then acts indifferently; and

consequently slaked lime was used. The lime, &c., removed a portion of the carbon bisulphide, as the following figures show.

| Material Used for Removal of Carbonic Acid. | Sulphur in the Gas. Grains per 100 Cub. Ft. | |
|---|---|---|
| | Before Removal of $CO_2$. | After Removal of $CO_2$. |
| Caustic lime . . . . . | 50·8 | 44·7 |
| Soda-lime . . . . . | 52·3 | 21·9 |
| Asbestos soaked in soda-lye. . . | 46·0 | 31·4 |
| Granulated potash . . . . . | 43·4 | 35·4 |

The gas, after treatment with soda-lime or potash for the extraction of carbonic acid, was passed at the rate of 0·0275 inch per second through a 12½-inch layer of alkalized cellulose, with the result that the sulphur in the gas was reduced by the latter from 17·9 grains (after soda-lime) to 9·3 grains per 100 cubic feet, and from 43·4 grains (after potash) to 10·5 grains. The gas before passage through soda-lime or potash contained about 45 grains of sulphur per 100 cubic feet.

These laboratory investigations showed that, at a low rate of flow, the alkalized cellulose was effective at ordinary temperatures, provided the gas was first freed from carbonic acid. If the latter were present, the material became inactive in proportion to the extent to which its alkali was converted to carbonate by the carbonic acid. Protracted trials on gas freed from carbonic acid by slaked lime showed that the "Athion" material remained permeable and active until it was saturated with carbon bisulphide. In these trials, the soluble viscose gradually became converted into the insoluble forms, and ultimately into hydrated cellulose and sodium thiocarbonate.

The latter trials by Dr. J. Reis, at the Heidelberg Gas-Works, are dealt with in Herr Kuckuk's paper [*ante*, p. 34]. The transposition of the process from the laboratory to the works mainly depended on a practical means being found for the extraction of the carbonic acid from the gas. Potash solution reduced the carbonic acid to a few tenths of one per cent.; but for the removal of these last traces lime has hitherto proved necessary. For each 0·1 per cent. of carbonic acid in 35 million cubic feet of gas, about 2½ tons of lime are required. It remains to be seen whether further development will result in lime being dispensed with, and whether the process will present great industrial advantages through the recovery of carbonic acid and the utilization of the hydrated cellulose.

## RHINE-WESTPHALIAN COAL DEPOSITS.

A recent number of "Engineering" contained some statistics, from a report prepared by Herr Kukuk and Dr. Mintrop, in regard to the Westphalian coal deposits on the right bank of the Rhine. While the coal deposits in most places are covered by layers of more recent formation, there is a three-cornered area of about 200 square miles—the Ruhr coal-fields proper—where the coal is at the surface. Towards the west the coal deposits pass under the Rhine, in direct connection with the left bank of the river, meeting farther north-west the Dutch-Limburg fields. In southern and south-western directions, the coal-fields are terminated by natural barriers. In the report in question, the coal is divided into four classes—gas-flame coal, gas coal, rich coal, and non-caking coal; and the fields into shaft zone, borehole zone, and zones not yet opened out.

Of the most remunerative strata the following quantities of coal are found in the shaft zone (600 square miles) and the borehole zone (675 square miles):—

| | Shaft Zone. Tons. | | Borehole Zone. Tons. |
|---|---|---|---|
| Gas-flame coal . . . . | 693,000,000 | .. | 4,400,300,000 |
| Gas coal. . . . . | 10,000,000,000 | .. | 24,500,000,000 |
| Rich coal . . . . . | 23,300,000,000 | .. | 40,900,000,000 |
| Non-caking coal . . . | 22,100,000,000 | .. | 24,000,000,000 |
| Total . . . | 56,093,000,000 | .. | 93,800,000,000 |

The quantities within the zone not yet opened out, the area of which is put at 1135 square miles, show an aggregate of 219,000 million tons, all of which is below the 4260-feet level; there being 64 per cent. below the 6560-feet level. At the higher of these levels, the coal for rather more than one-third of the total is gas-flame and gas coal; while below 6560 feet it is all rich and non-caking coal—about half of each. The less easily workable coal within the above three zones is calculated to amount for each zone respectively to about 25,000 million tons, 63,900 million tons, and 80,000 million tons—this coal occurring at varying depths. The aggregate deposits which cannot be worked remuneratively in the three zones is approximately 7500 million, 12,300 million, and 25,500 million tons.

The time during which the coal deposits of the area under survey will be able to hold out is very difficult to calculate, even approximately. It depends, of course, upon the increasing consumption, which has so far always been under-estimated. In the year 1800, the consumption was only a few hundred thousand tons; in the year 1900, it amounted to 60 million tons; and last year it had risen to 102 millions.

## PROFESSOR SABATIER ON CATALYSIS.

The Société Technique were fortunate at their meeting recently in Toulouse in being able to listen to an interesting lecture on this subject by Professor Sabatier, the winner of this year's Nobel Prize for Chemistry.

The lecturer first defined catalysis by a few examples of chemical systems which are modified merely by the presence of certain bodies—such as the conversion of starch into dextrine and then into glucose in the presence of sulphuric acid, and the combustion of hydrogen in contact with platinum sponge. He then passed in review the principal catalyzing agents, solid, liquid, and gaseous, such as platinum and the kindred metals, platinum black and sponge, nickel, copper, iron, certain oxides, sulphuric acid, water vapour, &c. The physical conditions of these agents has considerable influence on the results. In general, the pulverulent metals reduced to their oxides are much more active than the metals in their normal state. Thus, divided copper, heated to 180° C., converts acetylene into a different condensed carbide, poorer in hydrogen, and having the appearance of a spongy mass, whereas copper wire treated with acetylene is simply covered with a yellowish film. Hydrogen and oxygen when completely dry only combine at a temperature of 1000° C.; whereas in the presence of water vapour the combination is effected at a much lower temperature. Carbon monoxide will not burn at all in absolutely dry oxygen. Catalysis can thus produce quite a series of reversible phenomena, oxydation and deoxydation, hydrogenation and dehydrogenation, hydration and dehydration. Platinum black effects the oxydation of alcohol into aldehyde, and the hydrogenation of hydrocyanic acid into methylamine, &c. These actions have been studied by Professor Sabatier either alone or in collaboration with other eminent scientists. The result has been the preparation by hydrogenation of numerous organic compositions, several of which have received important industrial application, such as the hydrogenation of aromatic compounds and benzene by means of nickel.

Of all catalyzers, nickel is the most active. If care is taken, it retains its properties almost indefinitely. But the presence of certain impurities in the bodies to be catalyzed is absolutely fatal to nickel, and makes it lose all its qualities. The catalyzing metals may almost be compared to ferments; and, as in the case of living ferments, an infinitesimal dose of certain matters is enough to lessen and even suppress entirely their activity. Iodine and bromine are violent poisons for nickel, and sulphur in a slightly less degree. Attempts have been made to give a physical explanation of catalysis by saying that the porous, pulverulent nature of the susceptible matters brings on an increase in temperature on the contact of gases or vapours. Oswald can only see in catalytic phenomena a realization at a lower temperature of reactions which would take place at a higher temperature. Professor Sabatier rather inclines to favour the chemical theory of Berthelot, that the catalyzer forms with the body to be transformed an unstable combination, which is destroyed, to be immediately reformed, and so on. Thus an atom of hydrogen and an atom of platinum form a hydride which can be isolated, which, in the presence of air, regenerates the molecular hydrogen, and which, acted on by the hydrogen, regenerates the platinum. One of the neatest applications of catalysis is the production of subphuric acid by contact, by the oxydation of sulphurous acid in the presence of sesquioxide of iron. Another very important application, and one much used in England, is the hydrogenation—the hardening—of oils by the action of hydrogen in the presence of nickel. The oils fix some of the hydrogen and are converted into grease.

Two applications of gas are of particular interest to the gas industry—the hydrogenation of carbon dioxide and carbon monoxide, and the decarbonation of carbon monoxide. Three volumes of hydrogen and one of carbon monoxide passing over nickel heated to a temperature of 200° to 290° C. are completely converted into methane and water vapour. This is a property peculiar to nickel, and capable of industrial application. At 300° C. carbon dioxide undergoes the same change. If carbon monoxide be passed over nickel at a temperature above 250° C., carbon dioxide and carbon are obtained. This is a practical method of freeing a gas of any of the carbon monoxide it contains. These are very delicate questions, the solution of which requires long study, which may, however, be duly recompensed, as were the efforts of the Société Badoise, which worked for thirty years on the synthesis of indigo, finally solved the problem, and at the same time discovered the process of the manufacture of sulphuric acid by contact. "I am convinced," the lecturer concluded, "that industry at large will come to the help of science, and bring to her knowledge the complications which can, and often do, occur in practice."

**Recent Wills.**—Alderman John William Stone Dix, Chairman of the Bristol Gas Company, and "Father" of the Bristol City Council, whose death, at the age of eighty-two, was noticed in the "JOURNAL" for the 8th of April last, left estate of the gross value of £130,161, of which £75,440 is net personalty. Mr. John Freeman Peckett, one of the firm of Messrs. Peckett and Sons, Limited, locomotive builders, of Bristol, left estate of the gross value of £27,397.

# THE WATER SUPPLY OF JERSEY.

By Alfred J. Jenkins, Assoc.M.Inst.C.E.

**[Abstract of a Paper read before the Institution of Water Engineers.]**

Jersey has an extreme length of nearly 12 miles from east to west, and a width varying from 4 to 7 miles. Its north-western, south-western, and south-eastern portions consist of coarse-textured syenitic granite; while between the two first-named areas, and extending to the middle of the island, the rock is a stratified archæan shale. The north-eastern part consists of volcanic rocks, chiefly "felsite" in a variety of forms. The north coast varies in altitude from 250 feet to 480 feet; and the south, from sea level to 200 feet. In a general sense, the island may be said to slope to the south, in that the six principal streams rise near the north and west coasts, and discharge into St. Aubin's Bay, which occupies the middle of the south coast. The population numbers 52,000, at which figure it is constant. Prior to 1870, there was no public water supply; and the first attempt to introduce one was badly conceived. The insufficiency and inferiority of the service created a prejudice against the supply which it has been difficult to overcome.

The Jersey New Water-Works Company was formed in 1882. It took over the works of the former enterprise, and has steadily, though perhaps not rapidly, developed a sound concern supplying an excellent water in adequate quantity. The source of supply is the St. Lawrence stream, which drains the central watershed—an area of 1200 acres. Much of the water is derived from springs issuing from among the volcanic rocks at the head of the watershed; but the bulk of the flow is the drainage of cultivated land, which is stored and filtered, and subsequently pumped to a sufficient elevation. The average annual rainfall over a period of 35 years is 33·68 inches, with a maximum of 47·66 inches (in 1910), and a minimum of 26·54 inches (in 1887).

## Storage.

Much of the difficulty experienced by the former Company was due to insufficiency of storage accommodation, so that at times water had to be taken directly from the stream to the filters. With highly cultivated land forming the greater part of the gathering ground, very careful selection of water is most important; and the reservoirs are now provided with bye-pass brook-courses into which flood water is directed. The total capacity of the reservoirs is equal to fifteen weeks of summer demand, apart from the inflow during that period; so that, allowing for the estimated increase which will result from the condemnation of existing shallow wells, the author considers sufficient storage has been provided for at least another fifteen years. The larger storage reservoirs contain 31 and 13 million gallons respectively; and, when possible, water is admitted to the former and decanted off into the latter, whence it is decanted into the filters. This operation has only been possible since the larger reservoir was brought into use in 1910, since when the quality of the water, especially in regard to uniformity, has materially improved.

The larger of the two reservoirs (known as the Dannemarche reservoir) was constructed in 1908 and 1909, as a consequence of the resources of the Company having been severely tried by the drought of 1906. A detailed description of this will be given later.

## Filtration.

Ample filter area has been provided in the form of 2180 square yards of open sand filters, with which it is seldom necessary to exceed a filtration speed of 3½ inches per hour, at which rate bacteria are almost entirely eliminated. Each filter is provided with a notch gauge outlet, and the filtration head is limited to 2 ft. 9 in. The filter sand is a moderately fine shore sand obtained locally; and it is interesting to note that it is seldom necessary to scrape the beds more than three times a year, when about ½ inch is removed for washing. In one year, the surface of the filters choked within three weeks of cleaning in the early spring. The author tried the experiment of raking over the surface to a depth of 2 or 3 inches, and allowing the effluent to run to waste for a couple of days; and as a result of this, the beds worked well for three or four months afterwards without further interference.

## Pumping.

The works being situated near the lower end of the valley from which the supply is derived, it is necessary to pump to a service reservoir to supply the higher parts of the district. At the present time, the whole supply is raised to 150 feet above high-water level, but the question of zoning the district, with the object of reducing the quantity to be pumped, is under consideration. The pumps consist of two units, either of which is capable of raising nearly 40,000 gallons per hour—one a compound beam-engine and the other a triple-expansion Worthington pumping-engine. The two pumps deliver into a covered service reservoir of about one day's capacity, whence there are duplicate trunk mains to St. Helier. The outflow is metered by a "Palatine" recording meter, which has done excellent service.

## Dannemarche Storage Reservoir.

The site selected for the reservoir was to a certain extent determined by the possibility of obtaining land without compulsory powers; but an excellent site was eventually secured at the rate of £250 an acre—not an unreasonable cost, having regard to the highly productive nature of the land. It was situated about 1¼ miles from the southern end of the valley, and about ¾ mile above the Milbrook storage reservoir. Top-water level was fixed at 132 feet above high-water level.

The middle of the valley is covered with about 10 feet of alluvial deposit, below which lies the archæan shale. At the eastern end of the trench, this shale came to the surface, and was extremely hard and close; but at the western end there was about 20 feet of loose and shattered ground before tight shale was met with. The whole of this shale is very contorted, and the layers vary in thickness and quality within a distance of a few feet. They lie almost vertically, and nearly parallel to the trench. Owing to the numerous twists and folds, several fissures were met with, each of which was followed down until the point was reached at which it closed up.

The face of the dam was carried down vertically, and for a width of 6 feet to a water-tight foundation; the greatest depth being 36 feet. The remainder of the base rests on two benchings; the toe being generally taken 2 feet into the rock. The irregularities of the foundation gave very good hold for the dam, and the pressure at the toe is only 4 tons per square foot. A diagram of the lines of pressure in the dam shows that the resultant line of pressure with the reservoir full falls within the middle third throughout the section, but that with the reservoir empty the resultant falls just outside for a large portion of its length. This results in a maximum tensile stress at the toe of about 310 lbs. per square foot, giving a factor of safety of over 100. The object of making this departure from the usual practice was to save masonry, while giving a vertical inner face to the dam. This may be open to adverse criticism; but the author can see no objection to it, because the stability of the dam is in no way impaired. It is interesting to note that many dams which have been designed to be free from tension, and are so on horizontal planes, are nevertheless subject to tension on vertical planes near the toe when the reservoir is full—a fact which is frequently overlooked, and which generally occurs when the toe of the dam approximates to the horizontal.

In order to dispose of material from the trench, and to fill up an unsightly hole between the dam and the road embankment south thereof, the excavated ground was dumped at the back of the dam. By this means also two other purposes were served. Firstly, the lower part of the down stream face could be left rough; and, secondly, the filling was used to carry a locomotive crane, the run being eventually lifted (temporarily) about 5 feet higher than the finished level of the backing to the dam, in order that a 31 feet jib might reach the top of the wall. This backing of earth, &c., was not carried high enough to have much effect on the dam, and only resulted in the lines of pressure being moved a little nearer the centre of the section.

## Materials.

The dam was built of portland cement concrete, with irregularly shaped displacers; and the exposed faces were built with coursed and, for the most part, squared granite rubble. The sand used was a mixture of sea sand and finely crushed granite; and all the stone was granite. The proportions of materials used were 1 of cement to 6 parts of granite and sand, except where the dam was less than 6 feet in thickness, where the proportion was 1 to 5. There was always a considerable margin of mortar to allow for imperfect mixing and for bedding and surrounding the displacers; and the mixture was kept wet. The use of a quantity of finely-crushed granite in lieu of part of the sea sand made the mortar easier to work, especially in bedding the displacers. Furthermore, it probably added to the water-tightness of the work.

The author had hoped to get 30 per cent. of displacers into the wall; but owing to the irregular shapes of the stones and the difficulty of handling large stones, not more than 20 per cent. were actually used. The displacers were not placed within 6 inches of each other. Many of them were inserted point downwards into the concrete; but stones with a good, even base were set on that base by being well rocked, thumped, and twisted into position. In the portion of the wall less than 6 feet thick no displacers were used.

Where the thickness of the wall permitted, the concrete was laid in three rows of rectangular blocks, each block being a day's work. The sides of the blocks were timbered where the work did not butt against either face-masonry or old concrete, and in the transverse joints large V notches were left to be keyed into by the succeeding blocks. The timbering of each block was arranged so that longitudinally and transversely it broke-joint with those immediately beneath and those surrounding it. When the concrete was brought up to the level of an adjoining block, the timbering was either set forward on it or back on the block in course of construction, in order to avoid a vertical joint. At the end of each day's work the concrete was finished at a level different to those of surrounding blocks. All concrete was roughed with picks before subsequent work was put on or against it. A horizontal layer of cement mortar was the commencement of each day's work.

Masonry facework was carried up in advance of the concrete, and allowed at least four days to set, after which the concrete backing was brought up to its level, and the masons were allowed on it again after four days more. Where the wall became narrow, only two rows of blocks were possible; the one being the backing to the masonry on the inner face, and the other of that on the outer face. The same care was taken to break-joint; and, in

addition, the bed joints were now broken by leaving a key—this being, in the author's opinion, preferable to a longitudinal notch, as it offers greater facilities for roughing and cleansing. The concrete was hand mixed. The masonry of the inner face had the joints raked out 2 inches deep before the mortar had set-hard, and was afterwards pointed-up with mortar comprised of 1 part of cement to 1½ parts of sand. The outer face had the joints struck as the work proceeded. The valve-shaft in the centre of the dam was built as part of the dam. It contains valves which can be used to draw off from three different levels.

The portland cement used throughout the work was to B.S. specification, specially slow-setting. Each consignment was carefully tested in regard to fineness, expansion under Le Chatelier test, and tensile strength. If there was a satisfactory growth between the seven and fourteen day samples, and the makers reported a satisfactory twenty-eight day test, the consignment was used without waiting for that test being made locally, so as to save storage and prevent the cement getting stale. In every case the local twenty-eight day test proved satisfactory; and briquettes, tested subsequently one, two, and three years after making, gave excellent results. The cement being exceptionally slow-setting, the age of the briquettes was reckoned from the time when it had set hard. If this had not been done, some of the consignments would not have attained sufficient strength to pass the seven-day test; whereas the longer tests have since proved those consignments to have been of excellent quality.

### Cost of the Works.

Apart from the land, the construction of the reservoir, which has a capacity of about 31 million gallons, cost £11,700. Of this, the dam, which contains 4758 cubic yards, cost £7030. The concrete cost 22s. per cubic yard. The construction was carried out by the author, with Mr. W. Rees Jenkins, Assoc.M.Inst.C.E., as Resident Engineer.

### DISCUSSION.

The President (Mr. C. Clemesha Smith, of Wakefield), in the name of the Institution, thanked Mr. Jenkins for his eminently practical paper, which, he said, was peculiarly interesting from the fact that it was the first they had had before them describing the water supply of Jersey.

Mr. S. C. Chapman (Torquay) said he happened to know something about these works before Mr. Jenkins went to Jersey, having been in charge of them for a period of three years. He had the privilege of visiting the trench while the works were in progress; and he must say that Mr. Jenkins was fortunate in getting the foundation he did. The country was very peculiar; the higher part being granite, while the southern portion was in the shales. The valleys were extremely narrow, and had steep sides; and the dams possible were necessarily very short. It must be remembered that, in dealing with granite, one was not dealing with the beautiful stone obtainable in some parts of the country, which could be worked so easily. In Jersey, the material was very twisted, and the amount of labour would be very excessive in regard to the number of displacers available. He thought it would have been better if the number of displacers could have been greater.

Mr. H. Preston (Grantham) said the conditions which obtained in Jersey were peculiar. They were told that the population was 52,000. He would like to ask what proportion of this 52,000 was supplied by the water-works, because the watershed seemed particularly small for supplying a population like this.

Mr. C. H. Priestley (Cardiff) congratulated Mr. Jenkins on the way in which the work had been carried out, and on the admirable provision he had made for supplying the population. Was anything done in the way of preventing pollution on the drainage area? He believed it was difficult to do so in this particular instance, and it would be interesting to know if anything was done. As to the scraping of the filters, he took it that Mr. Jenkins did not give this as a proper thing to do, as scraping a filter in this way must lead to some difficulty afterwards. It would not be a good thing to do except under exceptional circumstances, such as those Mr. Jenkins had mentioned.

Dr. Lapworth (London) asked whether the joints were cut out and the mortar rammed in, or was it simply put in with a trowel? Dr. Deacon used to rake out all the old mortar, and caulk with cement which was only sufficiently watered to enable it to run.

Mr. E. Sandeman (London) congratulated the author on his cost, which he thought was really very low. He knew of many constructions which had cost more in proportion. Constructing with granite was really expensive work.

Mr. J. W. Swales (Leeds) said he had recently had to deal with filters where they had to adopt scraping to get over a difficulty. Nothing had had to be done before for over forty years. Within the last six weeks the filter-beds, which usually ran from ten to twelve weeks, had been choked in from three to five days; and they had to resort to the temporary expedient of scraping the beds. They left the water in and raked over the surface, and let it stand six hours. Then they ran the water through to waste for 48 hours. Samples were taken for bacteriological observation every six hours. After the first six hours, the bacterial results on the filter-bed were very much worse than the raw water; but at 24 hours, it was equal to ordinary filtration results. The net result, after scraping the beds and running to waste for 24 hours, was that the water was quite satisfactory. It was not good for the beds; but it had to be adopted as a temporary expedient. He thought this information might be useful for members if ever they were in a similar difficulty.

Mr. Jenkins said he was induced to bring this matter before the members chiefly because the cost of the works came out so low. He was disappointed that he could not get in 30 per cent. displacers. He was appalled at the cost and the waste he would have had to incur. He had made a fine estimate, and did not want to see it exceeded. He could not have squared these irregular blocks of granite without incurring great expense. As to raking the filters, he did not claim any originality for this idea. The same thing was done by the engineers of one or two London companies, and was the subject of a short communication to the Institution of Civil Engineers. The reason he had to resort to it was that his four beds all choked up at once, and, owing to the small size of the service reservoir, he could only maintain a supply by working at least three of the beds. He was agreeably surprised at finding the beds did not want any further attention during the summer. He had samples taken two days after the scraping was done. He did not begin quite so soon as the gentleman from Leeds, as he did not think it possible the beds would recover in less than 48 hours. But in 48 hours he found that things had so much improved that they could bring the water into use a couple of days afterwards. He could not give the exact number of the population supplied; but half-a-million gallons per day was their maximum. As to the prevention of pollution of the drainage area, unfortunately they had had one or two scares in the island, and the Sanitary Committee had taken up the question of pollution. No fault had of recent years been found with their water; but there had been two or three epidemics, which caused the Sanitary Committee to wake up and do something. There was no law about the pollution of streams, but there was a certain amount of tradition; and the constables, who were practically the mayors of the parishes, did just what they liked. The constables stirred things up, and the Sanitary Committee made a move; but it meant that they had to pay the piper. They had to make arrangements with the farmers; and when they paid them certain sums of money to abate nuisances, they got the right of inspection in the future. They had to buy up some sources of pollution where possible. The pointing was not caulked, but was very carefully done with mortar, in the proportion he had mentioned. It was pressed in as tightly as possible. It was not really hammered in, but worked in with small trowels, into good-sized joints, as efficiently as possible. He was limited in the size of the reservoir by the ground.

## AUXILIARY GAS-HEATER FOR FIRE-ENGINES.

According to an article in the "Gas Age," by Mr. J. B. Redd, the Industrial Fuel Engineer of the Pacific Gas and Electric Company of San Francisco, this city claims the distinction of being the first city in the world to make use successfully of illuminating gas for maintaining a constant steam-pressure on every fire-engine within its incorporated limits. The Fire Department has now 45 engines—or "steamers," as they are known to the firemen—in service. Each engine must be ready at any time, day or night, to answer an alarm of fire, which means that a certain amount of steam must be carried on the boiler at all times. Often the fire is within a stone's throw of the engine-house, and unless the gauge shows from 5 to 10 lbs. of steam when the alarm is answered, there is a possibility of much damage being done before a sufficient steam pressure is raised to start the pumps.

The old method kept the engine ready for work by the use of a coal-fired circulating heater installed in the basement, and working on the same principle as a circulating gas water-heater on the coal-range connected to an ordinary kitchen water-tank. The engineer on watch necessarily had to replenish the fire, occasionally finding it entirely burnt out—meaning, of course, a cold boiler before the fire could be re-made. Besides being unsatisfactory, these heaters were extravagant coal consumers, and their upkeep was expensive.

The gas apparatus, which successfully maintains a steady steam pressure on the boiler, consists of polished brass pipe, a combination of swing joints, valves, and a burner of the bunsen type, which can be quickly and easily removed from the fire-box. An indicating valve regulates the flow of gas—the valve being set to pass just enough gas to maintain the desired pressure. The loss by radiation from the boiler varies but little during the 24 hours; and this loss acts automatically in not allowing the steam to rise beyond the point for which the valve is set.

The engines are equipped with either a Fox or a La France boiler. The latter is of the circulating type, while the former is not; and, for equal results, 20 lbs. of steam must be carried on the Fox against 5 lbs. on the La France. A constant steam pressure is maintained on each boiler 24 hours per day with an average of 800 cubic feet of gas, which is a saving to the city of at least 40 per cent. over the cost of coal. The estimated saving to the city by the use of gas-burners over anthracite coal for heating the entire 45 engines is $6480 per year; while the gas company secure an excellent piece of business of practically 100 per cent. load factor, which brings in a good monthly revenue. A three-light intermediate meter is used for registering the gas for each engine; and the reading is taken each day by the engineer in charge. The cost of the gas apparatus is only one-tenth that of the old type coal-heater; and it is stated that the saving in the cost of fuel will offset the price of the installation within a few months.

## UTILIZATION OF SMALL COKE.

This was one of the subjects that were set down for discussion at the recent congress of the Société Technique de l'Industrie du Gaz en France. It was introduced by M. Laurain, who gave a very clear account of the present state of the coke market. In consequence of the large development of central heating, brought about by the change in public taste, scarcely any small coke of the Nos. 0 and 1 sizes [1½ in. and 2 in.] is now burnt in stoves, and its consumption in kitchen stoves, which was never very great, is not likely to thrive in competition with the ever-increasing use of gas for cooking. Moreover, boilers for central heating work best with larger coke; and the latter is constantly finding fresh industrial outlets, especially for heating boilers. On the whole, the biggest demand is for larger coke. Coke-dust, after great efforts to extend its industrial uses, has satisfactory sales. But sizes 0 and 1 are accumulating in a disquieting way, and at all costs their production must be reduced and their use largely increased.

For the last twelve years the Société du Gaz de Paris has not broken its coke—screening having proved sufficient. The small coke in question can very well be used for the producers of gas furnaces; and every effort should be made to encourage their use in small boilers for central heating, in producers, and in such heating apparatus as that which was awarded a prize by the Société last year. Except in a few privileged parts, the sale of this small coke is exceedingly difficult, and only the regular sale of large coke can prevent the accumulation of stocks. Simple screening should be sufficient to provide all of sizes 0 and 1 required for domestic heating.

A large number of those present then mentioned various uses to which they had put the coke in question—sizes 0 and 1, and slack for boiler-heating and producers; size 1 for manufacture of water gas with moderate air current; making a mixture of 60 per cent. coke dust and 40 per cent. gas coal, giving a fuel of 25,800 B.Th.U. calorific power, which can very well be burnt on Niclausse grids; use of small gas coke in metallurgical furnaces, &c. M. Pierson reminded the members of some experiences recounted at the 1906 Congress by M. Godinet and in 1912 by M. Lhomme of coke for producers. He mentioned one of 400 H.P. consuming size 0 coke.

## TESTING DRY GAS-METERS.

The "Journal of the Franklin Institute" for last month contains some notes, supplied by the United States Bureau of Standards, on the papers submitted at the eighth annual conference on weights and measures, held in Washington in May, at which representatives of the various states and cities having superintending officials of weights and measures were present. One of the papers related to the testing of gas-meters; the author being Mr. M. H. Stillman, one of the staff of the Bureau. It was intended to present very briefly the problems involved in testing the ordinary dry gas-meter, and was divided into three parts: (1) Description of the meter; (2) comparison of it with a calibrated meter or prover; (3) comparison of the calibrated meter or prover with the standard cubic-foot bottle.

The author laid emphasis on the necessity of keeping the testing medium (gas or air) involved in the comparisons at very nearly constant temperature, pressure, and relative humidity. Since the ordinary consumer's dry meter measures the volume of gas passing, the most direct and natural way to test this type of meter is to pass a known volume of gas through the meter, and notice whether or not the indicated volume is correct. The present methods of accomplishing this consist generally in either passing the testing medium (air or gas) through a standard meter and the meter under test in series, or else supplying the testing medium to the meter under test from a meter prover.

In order to obtain correct results by the above methods, the following conditions are requisite: (1) That when using a standard test meter it shall correctly indicate the volume of gas passed through it; (2) that when using a prover the prover shall correctly indicate the volume of gas delivered by it; (3) that when using either standard meter or prover there must be very little or no change in volume of the testing medium during its passage from the standard apparatus to and through the tested apparatus that is employed.

In order that these three requirements may be fulfilled, the meter prover or test meter must be correctly calibrated; the testing medium (air or other gas) and every part of the system which might influence the temperature of the testing medium during the test must be at the same temperature, and remain at very nearly constant temperature during the tests; and the testing medium must not during the test absorb any vapours or other gases which may appreciably change its volume.

Among the awards of silver medals by the Council of the Royal Society of Arts for papers read last session was one to Mr. Walter C. Hancock, F.I.C., for his communication on "The Physical Properties of Clay," which was noticed in the "JOURNAL" for the 22nd of April (p. 265).

# CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

### The Gas Exhibition and the Society of British Gas Industries.

SIR,—We are much indebted for your kind insertion of our letter. Your British sense of fairness, we are sure, will allow you to let us use your columns again.

Your comments, which doubtless may be taken as official, show that the "B.G.I." having "guaranteed half the total expense of the exhibition . . . is, therefore, fully entitled to first consideration; . . . and all firms other than members of the Society applying for admission of their goods to the exhibition are rightly referred to the Society in the first instance." This admits that the "B.G.I." has cornered the exhibition to a very large extent; for it has been given privileges which no one outside its doors can command.

Now, the principles involved in this little matter are, we submit, the following:

1. That the Institution of Gas Engineers and the "B.C.G.A." have no right to sell the gas industry, in whole or part, to any combination of trades, whatever price that combination of trades may care to pay for it.
2. That the Institution of Gas Engineers and the "B.C.G.A.," acting for the whole gas industry, cannot continue to recognize a Society as representing the British gas industries which refuses membership to any "duly-qualified firms . . . holding a recognized place in the gas industry."
3. That so soon as any Society claiming to be representative of the gas industries of Great Britain—a position which it claims and is accorded—refuses membership to any "duly-qualified firms . . . holding a recognized place in the gas industry," it must be called on by the representative authority—the Gas Institution and the "B.C.G.A."—of the gas industry to give its reasons for withholding full membership to the firm concerned.

In regard to No. 1 principle, we will not pursue this at the moment beyond stating that we recognize that, owing to the shortsightedness of gas undertakings, whenever money has to be spent on advertising, they will always make any arrangement with traders, however undignified it may be, rather than find money for the purpose in a direct and businesslike manner.

Principles 2 and 3 resolve themselves into one, so far as the present discussion is concerned; because if you admit that you are wrong in your remarks, it must follow that the "B.G.I.," the Institution, and the "B.C.G.A." are wrong. If you still claim you are right, all we ask for is a clear statement of facts on which your case is based.

Now, Sir, your comments point very clearly—more clearly than justifiably—to there being some disability in the case of the Helm Lamp Company, which precludes their coming under the heading of firms "holding a recognized place in the gas industry;" for you say, referring to the "B.G.I.": "With the grounds on which the Council of the Society have refused applications for membership, we have nothing to do, unless a desire to exclude duly-qualified firms from co-operation in the exhibition were one of them. This, we are assured, has not been, and will not be, the case in any single instance. No policy of exclusion of firms holding a recognized place in the gas industry has been adopted," &c., &c.

Therefore your comment says that the Helm Lamp Company cannot be considered a duly-qualified firm, and that it does not hold a recognized place in the gas industry. We ask you to be good enough to state, as bluntly as you please, what you mean by this damaging assertion. You make it on behalf of the "B.G.I.;" so that you cannot mind our asking you to substantiate it. In order that there may be no mistake about the freedom of speech we allow you in this instance, we give you the assurance that nothing in the Statute book or any moral book of form shall be used against you. The only condition we impose is that you afford as full publicity to our answers as you give to the aspersions against us. Your comments, as they stand, are aspersions. They imply something that is not quite right—something that, to many minds, may convey the idea even of things dishonourable. We cannot think that either you or the Council of the "B.G.I" mean this interpretation to be put on the words and acts we call attention to.

Our ideas run on the broadest of lines. We hold that no Society claiming to represent the allied industries—traders, or however else they may be designated—can be allowed by you, or the industry you represent, to close their doors to any firm whose work and interests are solely bound up in the progress and welfare of the gas industry.

We did not mind whether we belonged to the "B.G.I." or not when we penned our first letter to you; but we *do* mind so soon as we are told we are not eligible.

The "B.G.I." must either prove its title or relinquish it. If it cannot prove its title, then we rely on all the best traditions of the industry's history to see that, whatever compact has been, unwittingly or otherwise, entered into with the Gas Institution and the "B.C.G.A.," it shall be reconsidered.

The fact that we are a comparatively new firm should only make our appeal for common equity in these matters the more certain of success.

We can point to the work of our own hands—to a business built-up by the application of experience and work to materials on lines of our own. We are an industrial and manufacturing firm in every sense of the word. And mark you, Sir, this does not apply to all the members of the "B.G.I.," who are to be especially privileged, and whom all the gas companies of the kingdom are asked to subsidize.

Since the date of the refusal of our application to become members, of the "B.G.I." (April 18, 1913), we have endeavoured, in vain, to obtain satisfaction without publicity as to why the Council of the "B.G.I." was "unable to entertain our application." We felt that some huge error had been made; and we still feel that there is some

huge misunderstanding. We are quite aware that our case has only been before the Council of the "B.G I.," and that the bulk of the members we know do not and cannot agree with the attitude of the Council as it at present stands and is understood.

We must not, therefore, be blamed for bringing these matters into the light of the mid-day sun. If our side is wrong, then we will take our "licking;" if your side is wrong, you, too, will know how to act. But let no man say that only one side played the game.

HELM LAMP COMPANY,
per W. M. BUTLER, Managing-Director.

*Nuneaton, July* 5, 1913.

[The Institution of Gas Engineers and the British Commercial Gas Association obviously cannot sit in judgment upon the Council of the Society of British Gas Industries, in regard to any individual case of application for membership, in the manner suggested by our correspondent. His grievance is against that Council; and we must leave them to deal with it. We made this point perfectly clear last week in the remark that "with the grounds on which the Council of the Society have refused applications for membership we have nothing to do." We are not in the confidence of the Council sufficiently to have been favoured with the reasons for any of their actions in this respect; and therefore we decline to have the assurances of general application that were included in our note last week twisted so as to have any individual application. We are, however, glad to observe that our correspondent does not think that either the Council of the "B. G. I." or ourselves intend that the interpretation he choses to put upon our words shall be given to them. The matter with which we are more concerned has regard to the suggestion that the exhibition, through the scheme of which co-operation runs, has been "cornered" or "sold." On that point, we are satisfied that it has not been "cornered" nor has it been sold; and this conclusion will, we feel sure, be the general one in the gas industry.—ED. J.G L.]

## Charges for Electrical Energy for Gas Compressors.

SIR,—The success of high-pressure gas lighting against electricity has again brought to the front one of those obstacles to the progress of gas which only the electric undertakings seem capable of producing. I find that certain of these undertakings are still anxious to charge for the current used for driving electric motors at the lighting rate, when such motors are used for high-pressure gas lighting.

At the moment, I wish to instal in a town in England a small gas-compressor for lighting a shop, and to drive it by an electric motor. I enclose an application form from the particular town in question, from which you will see that they state:

> The current consumed by electric motors for driving compressors in connection with high-pressure gas lighting will be charged at lighting rates.

I shall be glad to know if the electricity people are within their legal rights in this matter, as I think this is a question which is very important for the gas trade generally; for it works dead-against the idea of co-operation between gas and electricity.

Indirectly, this is a good advertisement for gas, for it shows that electricity suppliers fear the efficiency of high-pressure gas lamps, and seek to throw every unfair obstacle they can in the way to prevent the progress of gas lighting.

I should be very much obliged if you would kindly put this before your readers; so that they may be informed how far they can object to the ruling. Otherwise, when objection is not possible, they must arrange matters beforehand in such a way that they can do without electric motors and use gas-engines for the compressors.

JAN C. VAN GOTHEM,
Chief Engineer, Welsbach Light Company, Limited.

344-354, *Gray's Inn Road, W.C., July* 5, 1913.

[The matter dealt with by our correspondent is one to which reference has been previously made in the "JOURNAL;" but it is a matter upon which no very definite ruling can be presented for the guidance of gas undertakings. The question has never been contested as to whether or not electricity suppliers are within their rights, without special enactment, in charging for an electric motor used for driving a gas compressor anything more than the ordinary highest power-charge for electrical energy ruling in the area of supply. As we have before pointed out, the suppliers of electricity in London, in making a higher charge for electrical energy used for gas compressing purposes, take refuge behind section 7 of the London Electric Supply Act, 1908. This section gives authority to charge a price not exceeding £6 15s. per kilowatt per annum of the maximum power required to be supplied, and ½d. per unit for all energy supplied: "Provided that no authorized undertaker shall be bound to give a supply upon the terms of this section in any case where *the maximum power required to be supplied is less than* 2 *kilowatts*. For the purpose of this section, the expression 'power purposes' shall include all purposes to which electrical energy may be applied other than for use either directly or *indirectly* for lighting." We do not suppose that when the clause was originally drafted, there was the slightest idea in the minds of the suppliers of electricity as to the application of the final words of the proviso quoted to motor driving for gas-compressing purposes. But the electricity suppliers claim that, under the interpretation of "power purposes," they have the right to charge any unreasonable price per unit they like up to the maximum allowable for lighting by their statutes. Further, there is the provision that "no undertaker shall be bound to give a supply upon the terms of this section in any case where the maximum power required to be supplied is less than 2 kilowatts." This, of course, means that the electricity suppliers have the right to make any charge they like for motors of less than 3-horse power; and, as is well known, the majority of the motors used for private gas-compressing plants are under this power. Technically, the vendors of electricity in London may be (we do not say "are") acting within their power in charging any sum per unit they like for power within the statutory limits. But, if so, the exercise of the power is unjust, and not at all dignified on their part. To differentiate between motors used for driving gas-compressors and other low-priced applications is significant of something that is not altogether creditable to electricity suppliers.

The Act of 1908 does not apply to the Provinces or anywhere outside the Administrative County of London; and the only enactments that appear to bear directly or indirectly on the subject are found in clauses 18, 19, and 20 of the Electric Lighting Act of 1882. In clause 18, the undertakers are prohibited from prescribing any form of lamp or burner in connection with the use of the energy; clause 19 imposes on the undertakers the obligation to supply; and clause 20 reads:

> The undertakers shall *not*, in making any agreements for a supply of electricity, *show any undue preference* to any local authority, company, or person; but, save as aforesaid, they may make such charges for the supply of electricity as may be agreed upon, not exceeding the limits of price imposed by, or in pursuance of, the Licence, Order, or Special Act authorizing them to supply electricity.

The 1908 Act appears to cover the London electricity suppliers in doing that which the Act of 1882 says they shall not do—that is, show "undue preference." It seems to us that where the suppliers of electricity in the provinces are charging lighting rates for energy used for driving gas-compressors, and 1d. or thereabouts per unit for the power required for the driving of (for illustration let us say) a hair-dressing or a knife-cleaning machine, they are showing "undue preference" to the latter, and are exceeding their powers in respect of the charge for gas-compressors, unless their Special Acts or Provisional Orders give them authorization similar to the London Act of 1908. Nor apparently have they any right to utilize the purpose to which an electric-motor is to be put in determining the charge to be made for the energy. That the matter is not covered by any general legislation so far as the Provinces are concerned appears to be conceded in the Derby Corporation Bill of this session, in which is a clause specifically providing:

> Notwithstanding anything contained in this Act, the Corporation shall not charge for any electricity supplied and used for the purpose of working motors used for compressing gas supplied by the Derby Gaslight and Coke Company at a higher rate than the highest rate charged by them for the time being for electricity supplied for lighting purposes.

Upon this clause, a comment appeared in our "Electricity Supply Memoranda" for May 6 last, p. 383.—ED. J.G.L.]

## The Testing of Gas-Fires.

SIR,—In view of statements which have from time to time appeared in your columns and elsewhere, I think it should be made known that the methods adopted by the Gas-Heating Research Committee in 1907-8 (including the method for the determination of radiant efficiencies of gas-fires) were originally worked out and standardized, under my general supervision, by Dr. Julien Drugman in the Fuel Laboratories of the Leeds University.

Dr. Drugman was appointed Research Chemist to the Committee on Nov. 1, 1907; and notwithstanding the summarized report on his work which appeared on pp. 18 to 23 of the "Transactions" of the Institution of Gas Engineers for 1908—supplemented as it was by a warm acknowledgment of its value by the Committee in their first report (*vide* pp. 59 and 60 of the "Transactions" of the Institution of Gas Engineers for 1909)—I have often felt that the great amount of experience, patience, and skill which he brought to bear upon the all-important, but perhaps thankless, task of investigating and standardizing the research methods, has never been fully appreciated by the industry at large. As a matter of fact, by the time that Dr. Drugman quitted the work, towards the end of 1908, all the principal methods had been devised and thoroughly tested.

The method for determining the radiant efficiency of a gas-fire ultimately adopted by the Committee originated in a Conference (in November, 1907, or thereabouts) between Dr. Drugman and myself (representing the Committee) and Dr. William Stroud, M.A., then Cavendish Professor of Physics at Leeds University. Professor Stroud, after careful consideration of the conditions under which gas-fires must usually be tested, advised the adoption of the thermopile *plus* radiometer method, in preference to a purely calorimetric one. During January, 1908, I was in correspondence with Professor R. H. Smith about the possible use of his radiometer, the actual working of which had been investigated in London by Dr. Drugman on the 6th of that month. Eventually, after certain modifications in the arrangements for measuring the water flow, &c., the instrument was adopted by the Committee, on our recommendation, for the determination of the calorimetric determination of the "centre reading" of the thermopile, thus completing the method.

It is, of course, true that about a couple of hours are required to

carry out by this method a determination of the total radiant energy emitted by a gas-fire; but it is, in my judgment, more trustworthy than such a direct calorimetric method as is described by Mr. Thomas Glover on p. 28 of your last issue. Indeed, a method where results admittedly require to be multiplied by an empirical factor 1·3, in order to make them comparable with the corresponding thermopile-radiometer values, stands, one would think, almost self-condemned. The Leeds method may not be immaculate, or incapable of improvement; but it is at least trustworthy and sufficiently accurate for all ordinary purposes, and, in view of the circumstances of its origin and adoption by a Committee representative of science and industry, it surely ought to be regarded as the standard method until something unquestionably better has been devised and as authoritatively endorsed. For, indeed, the measurement of the total radiant energy emitted by a gas-fire in particular circumstances demands considerable experience in the use of physical instruments, and a fine perception of the possible sources of error (and their relative magnitude) which long training alone can impart.

In conclusion, may I say that the interesting experiments published by Mr. Thomas Glover in your issue of the 1st inst. do not seem to me to prove anything more than that a Wright 10-inch "Talisman" fire has a greater total heating efficiency and a smaller flue-heat loss than the 10-inch Davis "Apollo" fire tested, and that I should not myself be inclined to attach much weight to his figures for radiant efficiencies.

WILLIAM A. BONE.

*Imperial College of Science and Technology,*
*July* 5, 1913.

## Treatment of Candidates for a Chesterfield Appointment.

SIR,—On April 10 last, I made application for the position of General Manager to the Chesterfield Gas and Water Board.

On applying for a form of application, it was stated that *twenty printed copies* of application and testimonials (cost to me on a tender price £2 10s., foolscap size, and ten spare), in stamped *unaddressed* envelopes, were required, and that they would be addressed and sent out from the Clerk's Office to the members of the Joint Gas and Water Board (whose names and addresses were refused. These were duly sent, in stamped, unsealed, unaddressed envelopes, 14 in. by 5 in.

This morning the whole lot were returned to me, *including formal application* (which was sent from here in April separate from above), together with the enclosed carbon copy letter.

It appears that the printed copies were never sent out from the Clerk's office, as they have never been addressed, and the stamps are uncancelled. They have, therefore, never been in the hands of the members of the Joint Gas and Water Board; and all applicants have been fooled. If you would like to see the package as returned to me, I will forward it to you.

The applicants were not even considered worth a letter signed by the Law Clerk, who I also believe is the Town Clerk of Chesterfield.

ALBERT R. CAWLEY.

*Cardiff, July* 3, 1913.

[ENCLOSURE.]

24, *Gluman Gate, Chesterfield,*
*June* 30, 1913.

GENERAL MANAGER.

Sir,—I am directed to return the testimonials which accompanied your application, and to add that the question of the appointment is for the present in abeyance.—Yours truly,

JNO. MIDDLETON.

[A reference to this strange matter is made in the editorial columns this week.—ED. J.G.L.]

## Newbigging's "Handbook."

SIR,—As an admirer of the "Handbook" who has reaped frequent benefit from the perusal and study of its pages, and having carefully compared the eighth edition with the seventh, I have been interested in reading the review published in the last number of the "JOURNAL," and agree with the writer's eulogy of the work. I am of opinion, however, that, in certain of his strictures, he has somewhat failed to realize the *raison d'être* of the book. It would appear that he looks on the luted retort-mouthpiece lid with contempt, and considers that its use should be discouraged. But there are scores of small gas-works which, by force of circumstances, cannot adopt anything but the luted lid. The present writer recently visited a small works where, owing to local conditions, the exhauster ran intermittently. Much as the manager would have liked to be up-to-date with self-sealing lids, he was compelled to adopt the luted type. There are scores of small works similarly situated, and also others where no exhauster is employed; and the "Handbook," to be generally useful, must take into account not only the larger works, but also the small gas undertakings.

The question of placing the gas-testing details immediately after "Manufacture," instead of in the position they now occupy, is merely one of opinion. To my mind, testing is a subject of its own, and is quite distinct from the descriptions of plant and processes which form the manufacturing portion of the book. So also as regards "Residuals." They are best dealt with under a separate heading, after the manufacture and distribution of the gas are completed.

Your reviewer will find, if he refers to p. 84, that mention is made of the coating of front walls of settings with non-conducting material to keep in the heat. True, it is suggested as a remedy for stopped ascension-pipes; but is not this the chief advantage? The insulation of the setting follows as a matter of course.

Mr. Newbigging refers on p. 46 to the practice of completely or nearly filling the retorts, and the adoption of ten and twelve hour charges; and the statement, though brief, is certainly warranted at the present juncture, with vertical retorts coming so largely to the fore.

The reviewer complains that the description given to vertical retorts is brief. Granted; but it is lucid, and it would hardly be possible to elaborate the subject, when, as our experience dictates, constructional details are constantly being varied. The "General Remarks" in the "Handbook" put the matter in a nutshell, where pages of constructional details might only confuse.

As to the inclusion of the general tables, which the reviewer deprecates, it is not in many books (if any) that these can be found in the same variety, amplitude, and detail; and no one who has experienced their usefulness, as the present writer has often done, will find fault with their inclusion. I, for one, should regret their absence.

I am prompted to make these remarks by the fact that, like your reviewer, I look upon the "Handbook" as an old friend. It should be recognized that the work is what it purports to be—a "handbook," not a treatise—and is therefore suggestive rather than exhaustive.

A. R. W.

*July* 4, 1913.

## The Early Use of Gas-Ovens.

SIR,—Looking through Newbigging's "Handbook for Gas Engineers," I note on p. 469 a reference to Mr. Sharp, of Southampton, having constructed a gas-oven about 1840.

Possibly it may interest you to look through copies of testimonials received from users of his gas-cookers in 1837, by which it will be seen that it was in 1836, if not earlier, that he manufactured gas-cookers. His first public lecture was given in Southampton in June, 1837, when he cooked a substantial supper; and after the lecture a large number of the company enjoyed the repast.

J. R. H. JACOBS, Secretary,
Southampton Gaslight and Coke Company.

*July* 5, 1913.

[ENCLOSURE.]

The following are the opinions of persons who have used the apparatus for some years—most of them were in use when gas in the towns was 10s. per 1000 cubic feet.

Mr. G. Smith, of the Green Man, Royston, wrote on Aug. 4, 1837—
Having had a cooking apparatus of Mr. Sharp, sufficiently large for 100 to 120 persons, I consider I am not doing him justice if I do not hand him this testimony of my entire approbation.

Mr. J. Deck, Chemist, of Cambridge, wrote on Aug. 20, 1837—
I have had your gas cooking apparatus in constant use for the last seven months, and am daily more convinced of its being the most convenient and philosophical application of heat that can be adopted in the culinary art. I have courted every public prejudice that could be brought against its use, and find not one of them tenable. Meat roasted by this process retains more of the animal juices than that exposed to the variable influence of a coal-fire, and consequently is of a superior flavour, and more nutritious.

I have proved, by several experiments accurately performed, that the waste in cooking by gas is much less than by any other means, and am satisfied that it possesses a decided advantage from an economical point of view.

Mr. John Russell, of the Bath Hotel, Leamington, on Aug. 25, 1837, said—
I have much pleasure in stating that the gas cooking apparatus put up by you far exceeds my expectations for roasting, boiling, and stewing; and having had it in constant use for more than twelve months, enables me to say I would not be without it on any account.

Mr. John Gibbins, of the Peacock Inn, Kettering, wrote on Sept. 4, 1837—
Having had Sharp's cooking apparatus in general use for the last twelve months, I must, in justice, say I consider it the most useful, as well as the most economical, mode of cooking; and I consider that no innkeeper ought to be without it, and its use ought to be more generally known.

Mr. William Allen, of Leighton Buzzard, on Aug. 2, 1837, wrote—
I have proved the gas cooking apparatus, invented by J. Sharp, and find it to answer admirably, both as regards economy and cleanliness.

Messrs. T. Boisragan, M.D., J. H. T. Spencer, M.D., Thos. Wright, surgeon, and Augustus Eves, surgeon, of Cheltenham, testified as follows on July 25, 1837—
We hereby certify that, having heard Mr. J. Sharp's lecture on "Cooking by Gas," and having examined his apparatus for that purpose, we most cordially approve of the same, considering it at once scientific, economical, and calculated—where practicable—to supersede every means in present use.

Mr. William Toller, of Kettering, wrote on Sept. 4, 1837—
I have much pleasure in bearing testimony to the great convenience and utility of Sharp's cooking apparatus Having used it six months, I have found it answer every purpose it is intended for most satisfactorily. I have found it quite unnecessary during the summer months to have a fire in the kitchen.

Notice of a very sumptuous dinner cooked by this means is recorded in a very useful little book, published by Simpkin and Marshall, in 1838, called "Hints for the Table," on pp. 15 and 16 of which you will find the following remarks: "One of the earliest specimens was constructed by Mr. Sharp, for the Bath Hotel, Leamington, by which a dinner—at a guinea a head—for 100 persons was prepared by one cook."

**Salford Coal Contracts.**—A somewhat heated discussion took place at last Wednesday's meeting of the Salford Town Council, in connection with a notice of motion that the Gas Committee is instructed to supply at the next meeting of the Council certain specified information with regard to the coal contracts entered into. Similar questions had been previously put; but Alderman Phillips had declined to answer them unless the Council ruled that he must—which the Council did not do. An amendment was finally passed, to the effect that the particulars asked for should be supplied by the Chairman of the Gas Committee at a meeting of the General Purposes Committee to be held on the 6th prox.

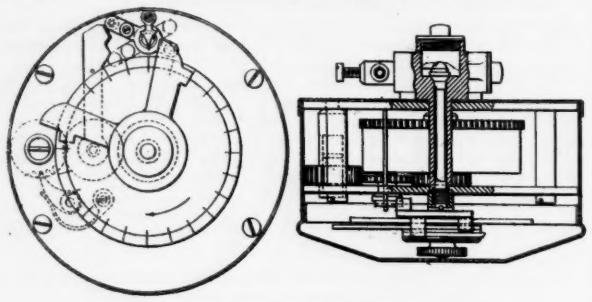
# REGISTER OF PATENTS.

## Gas-Controllers.

HUME, G. W., of Hyde Park Mansions, W.

No. 10,965; May 8, 1912.

This gas-controller is of the kind adapted to be actuated by clockwork mechanism for lighting or extinguishing one or more gas-burners at predetermined times, and to the class of apparatus in which the clockwork mechanism rotates a dial carrying a pair of arms designed to operate an oscillating or escapement arm which controls the gas-valve so as to alternately turn on and off the gas to the burners.



**Hume's Gas-Controller.**

The valve controlling the gas supply to the burner and to the bye-pass is actuated (as shown) by means of a pivoted lever or pallet furnished with a pair of pins which project respectively into the paths of two arms, which are of equal length and mounted in different planes upon the clockwork actuated dial. One of the arms, as the dial rotates, actuates one of the pins, so as first to open the main gas-valve and then to close the bye-pass when the burners are lit. The other arm actuates the second pin so as first to open the bye-pass valve, and then close the valve controlling the main burner supply. In conjunction with the pivoted lever or pallet there is also provided a spring trip-lever to coact with a projection or pin upon the rear of the pallet. The object of the spring trip-lever is to render the operation of the valve instantaneous and to carry the pallet into the correct position after each operation. By arranging the clockwork actuated arms in different planes, it is possible to control the gas-valve by hand at any time without altering the sequence of operations.

The illustrations are a front view of one form of the controller (the cover of the casing being removed) and a sectional plan of same.

## Rotary Gas-Engines.

TREBERT, H. L. F., of Rochester, New York.

No. 12,336; May 24, 1912.

This invention relates to gas-engines of the type in which the cylinders, with their axes parallel to the general axis of rotation of the engine, revolve about the axis of the engine, and have ports adapted to come into and out of register with the admission and exhaust ports in an intake-head surrounding the axis.

The object aimed at is to improve the valve arrangements through which the explosive charges are admitted to, and exhausted from, the cylinders, by arranging that the valve case of each cylinder is provided with a shoe containing the cylinder port and held by spring pressure against a circular track in the intake-head—the shoes continuously surrounding the intake-head and being the only friction surfaces working on the track. Such an arrangement is said to be of the greatest importance, since it is at the contact between the valve case and the intake-head that compression is lost or made. Besides the matter of compression in rotary gas-engines of this type is considered to be one of the principal bars to their practical use, inasmuch as the intake and exhaust must be effected by passage between moving parts. There are many other details of advantage and improvement pointed out with reference to a set of drawings accompanying a very long specification.

## Manufacture of Ammonium Salts.

PERRY, F., of Tipton.

No. 14,079; June 17, 1912.

This invention relates to "the manufacture of ammonium salts from the ammonia occurring in Mond or other producer, coke-oven, illuminating, and like gases, usually in association with sulphuretted hydrogen."

In carrying the invention into effect, the gas containing both ammonia and sulphuretted hydrogen is washed with a solution of sulphate or chloride of iron, so that there is obtained a precipitate of iron sulphide and a solution of an ammonium salt. The precipitated sulphide is separated by filtration, decantation, or otherwise; the ammonium salt solution being evaporated-down to the necessary strength and allowed to crystallize in the ordinary manner. Any tar or organic matter rising to the surface of the liquor during evaporation is separated before the solution is allowed to crystallize. The precipitated iron sulphide is dried and roasted in a limited quantity of air for conversion, as far as possible, into sulphate; or it is roasted with free access of air to form iron oxide.

The patentee remarks that when the proportion of ammonia in the treated gas exceeds its equivalent molecular proportion of sulphuretted hydrogen, the precipitate contains both metallic sulphide and metallic hydroxide.

## Producing Ammonia from Sulphocyanide Compounds.

BURKHEISER, K., of Hamburg.

No. 15,742; July 5, 1912. Convention date, Sept. 12, 1911.

Sulphocyanide compounds, the patentee remarks, are not in request as an article of trade, and are therefore only very rarely produced for their own sake. But as they occur as bye-products in most processes for the recovery of cyanogen, and render difficult the satisfactory production of other compounds, numerous endeavours have been made to convert them into more valuable or more easily removable compounds. The present invention relates to a method of freeing compounds which are impure, through the presence in them of sulphocyanogen compounds, from these impurities in such manner that the sulphocyanogen is converted into ammonia, "which can be very easily removed by known means and made of value."

The process consists in treating sulphocyanide compounds in solution with oxidizing or reducing bodies in the nascent state—such as superoxide of hydrogen and the like—or in bringing these compounds at a high temperature (not less than 300°, or in a melted condition, into contact with substances which give up water at the temperature named. As products of decomposition, the patentee mentions carbonic acid, carbonic oxide, and sulphuretted hydrogen.

Although (the specification continues) heretofore practically never employed, the conversion of sulphocyanide into ammonia is not quite new. Claus relates, in his work "Beiträge zur näherer Kenntniss der Schwefel-cyan-Metalle," that metallic sulphocyanides, heated with potassium-hydrate, produce carbonate of ammonia. Further, the statement is found in literature that sulphocyanic acid, when heated with diluted sulphuric acid, produces ammonia and oxysulphide of carbon. But according to these observations it was not by any means to be foreseen that a conversion of sulphocyanide into ammonia would take place on treating a dissolved sulphocyanide salt with nascent hydrogen or nascent sulphurous acid; also that on the melting together of sulphocyanide compounds with other bodies, these latter need not be alkaline. But the present inventor effects the conversion with substances other than coal or hydrated iron oxide, which substances are not alkalies yet yield water at high temperature. Complete conversion of the sulphocyanide into ammonia has been already effected by (among others) melting together or treating at high temperature sulphocyanide compounds with hydrated oxide of iron, or coal, whereas the present invention consists in the employment of, for example, oxalic acid and other bodies which yield water at high temperatures.

The above observations agree also, he says, with those made in the specification of his patent No. 11,517 of 1911, for "Improvements in or connected with the recovery of sulphite and sulphate of ammonia in the manufacture of gas," which says that the cyanogen compounds absorbed by the purifying mass in the regenerating process, which brings with it a high temperature, are converted into ammonia. It may be observed that in this 1911 patent sulphocyanogen compounds are not mentioned at all. This is also in agreement with the observation made in the patent specifications of George Edward Davis, No. 5717 of 1882, according to which, by adding spent ammoniacal liquor to the coal to be distilled, an increased yield of ammonia is produced.

The advantages of the conversion of sulphocyanide into ammonia to be attained by the process "are very important, because, as already stated, the sulphocyanide compounds are of themselves not only of little value, but also, when they occur as admixtures, are very difficult to remove; the ammonia, on the contrary, has an increasing trade value." As it is very easily separated from other compounds, and is recoverable by itself, there is, "besides the advantage of its recovery, the advantage of the purification of products valuable in themselves, which are contaminated and reduced in value by the presence of sulphocyanide compounds."

## Removing Sulphuretted Hydrogen from Gases.

BURKHEISER, K., of Hamburg.

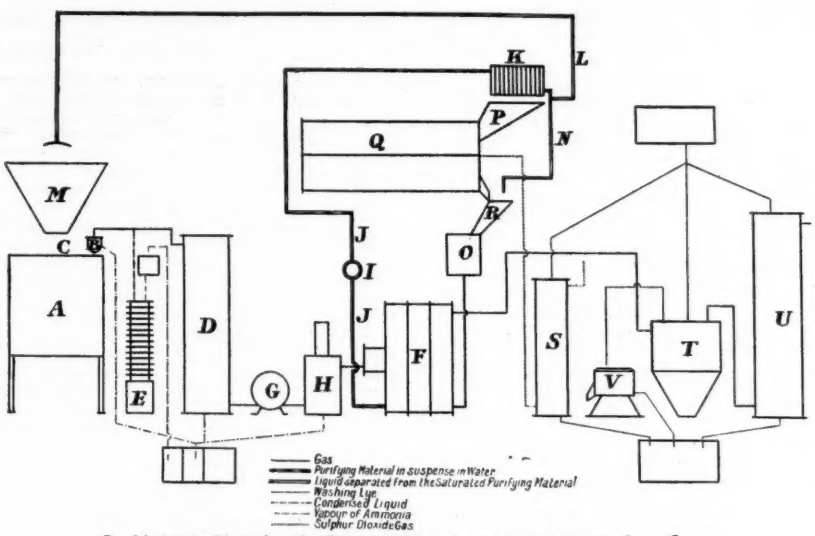
No. 16,172; July 10, 1912. Convention date, Sept. 26, 1911.

The patentee's specification is as follows: The processes heretofore usually employed for purifying from sulphuretted hydrogen gases produced by the distillation of coal consist almost without exception in passing the gases, after they have been freed from tar and ammonia, over lime or artificial or natural hydrated oxide of iron. This method of freeing from sulphuretted hydrogen requires (by reason of the extremely slow reaction of the materials employed under ordinary conditions) very extensive purifying apparatus. An advance was made in this direction by the Burkheiser process, wherein the reaction capability of the purifying mass employed was increased by a special preparation before its employment as a purifying material. All these purifying processes (including that of Burkheiser) proceed on the so-called dry purification, while the so-called wet purification is always regarded as the ideal of gas purification; and many experts and inventors have striven to produce such a practically employable process. Of all the wet processes of purification, the one nearest the hand of the expert is the washing of gases with metallic salt solution. But the experiments made with this object in view failed because this metallic salt solution could not be regenerated at all, or only with great difficulty, whereby the processes failed to be economical.

Reference may also be made to the very interesting process of the "Englishman Claus," who washed the gases with a solution of $NH_3$, drove off the absorbed $CO_2$ and the $H_2S$ by cautious heating to something over 90°, and used the remaining $NH_3$ solution again for washing the gases. But this process was not brought into practice, because the $CO_2$ always present in large quantities, and which drives the $H_2S$ out of the solution, makes it necessary that more $NH_3$ should be in circulation than is necessary for the combination, and consequently very great quantities of liquid must be heated and cooled.

Attempts have also been made to wash the gas with an elutriate of iron hydroxide of bog iron ore. But this process failed because iron hydroxide reacts much too slowly in the absence of a sufficient quantity of alkali.

The object of the present invention is a process for freeing gas from sulphuretted hydrogen by utilizing the "great reaction capability" of




**Burkheiser's Plant for the Removal of Sulphuretted Hydrogen from Gases.**

the alkalis for $H_2S$ for removing the latter from the gas, and regenerating the alkalis from the resulting alkali sulphides by hydrated oxide of iron, and further the regeneration of the hydrated oxide of iron and the recovery of the alkali so that they are available for re-use.

The process consists in the employment of an alkali solution, containing sufficient alkali to effect the complete absorption of the sulphuretted hydrogen, with the chemically equivalent quantity of hydrated oxide of iron in suspension for the purpose of regenerating the alkali during the absorption process from the alkali sulphide formed, and after the complete formation of the metallic sulphides, these are subjected to oxidation and separation by any known method into hydrated oxide of iron and sulphur oxides, so that both the hydrated oxide of iron and the alkali are again available for use in the purifying process. By this combination it becomes possible so to hasten the naturally slow reaction between $H_2S$ and hydrated oxide of iron in wet working, that the "gas purification can be carried out in an extremely small space."

The method of carrying out the process—which is specially suitable on account of the often high content of $CO_2$ in the gases of coal distillation—consists in supplying to the washer the iron-hydroxide simultaneously with the alkaline solution, so that the regeneration of the alkaline solution proceeds immediately, and this latter constantly becomes again capable of washing out $H_2S$. The saturated iron sulphur compounds are removed from the alkaline solution by filtration, decantation, or the like, and the filtrate with fresh hydrated oxide of iron mass again employed for the washing.

A modification and development of the process consist in oxidizing the sulphur contained in the purifying mass, separated by filtration from the alkaline solution—either by itself or along with the mass—to $SO_2$ or $SO_3$, and in employing these latter for combining with the $NH_3$ contained in the gas, while the mass freed from sulphur, and made again receptive, is returned into the working process and employed again for the regeneration of the absorption liquid.

In the process of sulphuretted hydrogen purification described, the cyanogen contained in the gases will claim, if special measures are not taken to prevent it, a large part of the hydrated oxide of iron by the formation of insoluble iron cyanide compounds, whereby the complete regeneration and re-use of the purifying mass is rendered difficult.

The object of the invention is to avoid the formation of insoluble iron cyanide compounds, by adding to the alkaline solution some sulphur or sulphur-containing mass, or by mixing with the gas air or oxygen (say one-half to one per cent. of oxygen). By this means "the whole of the cyanogen is simultaneously and completely absorbed, because alkaline polysulphides can form, and all the cyanogen is converted into the corresponding alkali sulphocyanide compounds." These compounds can, "as they are easily soluble, be easily separated from the iron sulphur compounds, and be submitted to a special treatment." As specially economical, it is said to be advisable to convert these sulphocyanide compounds into ammonia, as is described in patent No. 15,977 of 1912.*

A method of working, which has been confirmed by practice, is next described by the patentee, by the aid of the above illustration.

The gas produced in the retort-bench A passes through the hydraulic main B into D, and is there cooled. The ammoniacal liquor falling down in the cooler is treated in the distilling column E, and distilled back again into the gas before the purifier F, so that the gas passing this purifier contains all the $NH_3$. The exhauster G forces the gas through the tar-separator H, where the last traces of tars are removed. From there the gas passes into the sulphuretted hydrogen purifier, "which is assumed here to be a rotating purifier of the cyanogen-washer type." The wash liquid with the suspended hydrated oxide of iron mass is pumped from chamber to chamber in opposition to the gas; so that in the last chamber—that is to say, that into which the gas containing $H_2S$ enters—the mass is nearly saturated with $H_2S$, and the wash liquid is at its richest in sulphocyanide compounds.

Through the pipe J and pump I the mass in suspension from this last chamber is forced to the filter-press K, where a separation of the mass from the liquid takes place. A part of the liquid is pumped through the pipe L to the coal bunker M, moistens the coal somewhat, and goes with it into the retort-bench, where a conversion of the sulphocyanide compounds into ammonia takes place [see No. 15,977 patent], which ammonia goes over into the gas. The conversion of the sulphocyanide compounds into ammonia can also obviously be carried out in special vessels and apparatus.

The rest of the liquid and the liquid used for the washing of the filter cakes flows through pipe N into the vessel O provided with stirring apparatus. The filter cakes pass through the hopper P into the regenerator Q, where the revivification of the mass by air, up to the formation of sulphur dioxide or sulphur trioxide, takes place. The regenerated mass leaves the regenerator through the hopper R, falls into the vessel O, and is, with the pressed-out wash liquid, pumped back into the rotating purifier F, where it again enters its circuit. The $SO_2$ product in the regenerator Q is washed out in the air scrubber S, and the $NH_3$ contained in the gas in the saturator T and ammonia scrubber U. The salt formed is separated from the wash lye in the centrifugal V. The sulphurous acid generated in the regenerator Q by the oxidation of the sulphur is led into the air scrubber S, which is sprinkled with a solution of normal ammonium sulphite, or with a mixture of normal ammonium sulphite and acid ammonium sulphite. The gas containing ammonia is washed in the saturator T and scrubber U (which are arranged one behind another) by the lye coming from the air scrubber S, and this lye, as it consists mainly of acid ammonium sulphite, is capable, by the formation of normal ammonium sulphite, of washing out the ammonia from the gas. As normal ammonium sulphite is less soluble than acid ammonium sulphite, and the gas on entering the saturator T is most heavily loaded, mainly normal ammonium sulphite will form in the saturator, which sulphite falls down for the greater part as salt and is separated by the centrifugal V. The mother lye flowing away consists mainly of normal ammonium sulphite, and comes back to the air scrubber and begins the circulation anew from there.

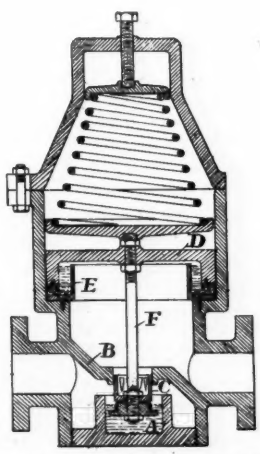
* The specification of this patent has not so far been published by the authorities.

## Gas-Pressure Regulators.

BARRETT, S. R., of Birmingham, and THORP, T., of Whitefield, near Manchester.

No. 18,048; Aug. 6, 1912.

This gas-pressure regulator is for use principally where the gases are supplied at high pressures in the mains; the patentees adopting, preferably in combination, a single valve, spindle, and weighted spring, together with a flanged or screwed body similar to those in general use.




**Barrett and Thorpe's Gas-Pressure Regulator.**

The cast-iron body shown (with flanged connections) has at its upper end a conical cover and at its lower end a screwed portion, which has a hollow or well A in which oil is placed. A midfeather B separates the inlet from the outlet. At its centre is a bored tube through which

the valve C passes—preferably formed of a hollow cylinder closed at its lower end. Perforations are provided at the side for the passage of gas when the pressure is lower than (or at) the pressure it is intended to be delivered.

The valve is provided at its lower end with a flange carrying an annular disc of leather, cork, or other flexible material; and there is also a cup-shaped leather which helps to make a joint between the valve and the bored tube through which the valve passes, and so prevents the outlet pressure from becoming higher than that desired and provided for by the spring.

D is the piston. Its length is preferably about a quarter to half of its diameter. It is ground to an easy fit in the cylinder in which it works, and is preferably of the same material—*e.g.*, cast iron. The piston head is a hollow cylinder; the closed end being at the top. To the underside of the piston head is attached a ring of leather or other flexible material about ¼ inch greater in diameter than the piston head, so that when it is in position it forms a cup-shaped packing as shown.

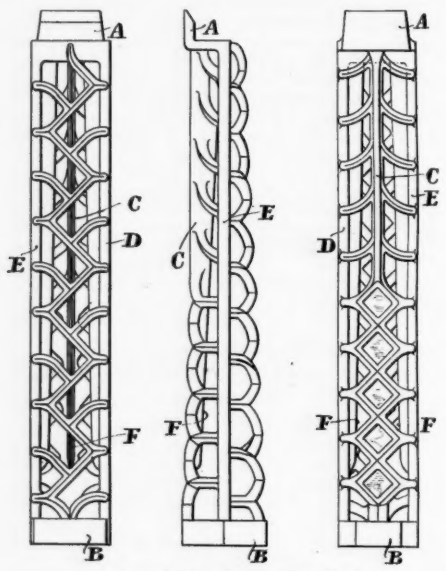
E is an annular casing filled with oil or other lubricant, which is forced by the pressure in the body of the governor up to the cup-shaped leather and "effectively lubricates the piston in the cylinder." The arrangement "not only keeps the piston lubricated, but prevents the escape of gas, as the capillarity between the piston head and the cylinder, together with the leather cup, is sufficient to prevent escape of gas at any but considerably higher pressures than those which are generally used." The piston head and valve are connected by the spindle F; and there is a helical spring calculated, when compressed, to balance the delivery pressure of the gas on the piston added to that on the valve. The spring is supported at its lower and upper ends by cup-shaped discs. There is a screw attached to the conical cover so that the tension on the spring can be varied within certain limits.

## Fuel for Gas-Fires.

DAVIS, H. N., and TWIGG, W. R., of Luton.

No. 17,945; Aug. 2, 1912.

This fuel for gas-fires is made in the form of vertical skeleton columns (from top to bottom of the stove) one over each nipple of the burner and each column moulded in one piece. The columns, which are so arranged that the flame passes up the interior space which is gradually reduced, consist of back vertical bars and two side vertical bars connected by curved irregular skeleton work, more open towards the front, as shown.




**Davis and Twigg's Gas-Fire Fuel.**

The lip A on the top of the fuel column fits into a groove in the stove casing, while the bottom B rests round the nipple. The back vertical bar C is connected to the two side bars D E by curved irregular skeleton work. Each of these bars has a rib F on its inner surface to project into the outer cone of the flame and "helps to extract the heat from the flame."

## Increasing the Calorific Value of Blast-Furnace Gas.

ZIMMERMANN, W., of Dresden.

No. 21,359; Sept. 19, 1912.

Hitherto blast-furnace gas, the patentee says, has been employed for heating and power purposes, although it possesses the disadvantage of having a low calorific power. To overcome this disadvantage, it is proposed to blow the blast-furnace gas into a coking chamber, by means of suitably disposed jets, nozzles, or the like, arranged in the walls of the coking chamber above the level of the coke cake—where the carbon dioxide is reduced, partly by the incandescent coke, partly by the hot coke-oven gases.

The advantages accruing from this method of introducing the blast-furnace gas are said to be considerable. The volatile products escaping from the coal at a relatively high temperature are cooled by the reactions resulting in the formation of carbon monoxide and consequent absorption of heat. As experience has shown, the cooling of the oven chamber and of the volatile products "results in an increased output of bye-products, owing to a reduction in the amount of decomposition, and has a favourable effect upon the life of the brick-work of the oven."

## Calculating Apparatus for Reckoning out Charges for Gas, Water, &c.

BRUCKMANN, H., of Benrath, Germany.

No. 21,446; Sept. 20, 1912.

This invention relates to "a calculating machine which is specially suitable for use in reckoning out charges for the consumption or use of gas, electricity, water, and so forth."

Explaining his proposal, the patentee, in his specification, says: Two numbers corresponding (for instance) to meter readings taken at the beginning and end of a month or other charging period are set successively upon numeral wheels; and their difference (which represents the number of units to be charged for) is obtained automatically in the machine, and then multiplied automatically by a number set on other numeral wheels—this latter number being the price of a unit. The product so obtained, being the charge for the number of units taken, may be added to another number representing (for instance) a fixed charge for meter-rent, and the resultant total charge is then shown on a set of numeral wheels provided for the purpose. Each of the other numbers in question—namely, the two meter readings, their difference, the charge per unit, and the product of the multiplication—may all be shown separately on other sets of numeral wheels, in order to provide a check as to the correctness of the settings of the machine; and the construction may be such that the numeral wheels showing the varying amounts are readily set back to zero, or to a predetermined starting position, while leaving the multiplier and the added amount (for meter-rent) set therein in readiness for the next similar accounting operation.

In the operation of multiplying, a type of mechanism already well known for this purpose is used, comprising a set of pairs of stepped or notched discs, having (respectively) units and tens notches in them of depths equivalent to the products of all the numbers from 0 to 9, multiplied by the numbers 0 to 9. In the known mechanism, rack bars or the like, which operate numeral wheels to show the products, have fingers or pins which can be caused to move into the notches—the extent of the movements determining the numbers recorded on the indicating wheels. Machines provided with such mechanism were not designed, however, to obtain first a difference between two numbers, then a product of the difference by a third number, and, if required, the sum of this product with a fourth number set in the machine; and it is the object of this invention to provide mechanism which will effect this purpose. At the same time the mechanism is specially designed as stated, to facilitate making a succession of similar calculations in which one or more of the numbers in question remains unaltered.

The details of construction of the mechanism are fully set forth in a lengthy specification of thirteen pages, illustrated by eleven sheets of detailed drawings.

## Piston Packing for Governors, Gauges, &c.

GLOVER, W. T., and BERRY, J., of Oldham, and METERS LIMITED, of Manchester.

No. 23,924; Oct. 19, 1912.

This invention relates more particularly to the means employed for preventing leakage of gas in connection with the pistons of gas governors, meters, and the like.

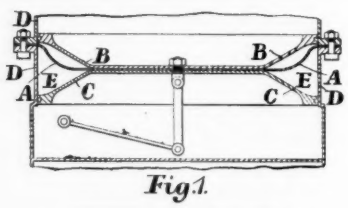



*Fig. 1.*

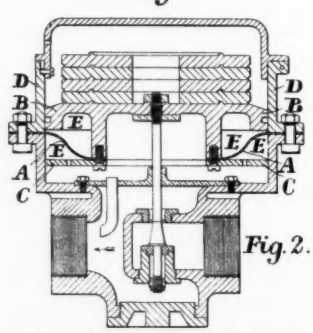



*Fig. 2.*

**Glover and Berry's (Meters Limited) Piston Packing.**

Fig. 1 shows the piston packing arrangement for use in a meter. Fig. 2 shows a gas-governor.

In fig. 1, A is a diaphragm between two portions B C of a piston; the peripheral edge of the diaphragm being clamped between adjacent edges of the cylinder or casing D. The loose portion of the diaphragm lies within the recess E between the two parts of the piston, and oil or semi-solid lubricant is provided in the recess on one or both sides of the diaphragm.

Fig. 2 is similar to fig. 1; the diaphragm A being attached to the loaded piston B C and to the valve casing D. Lubricant is provided in the recess within the piston and around the free portion of the diaphragm.

The leather diaphragm is thus maintained in a pliable condition, due to the immediate contact of the lubricant within the recess in the piston, which prevents the leather from perishing. The contacting

sliding surfaces are also maintained by the lubricant in efficient condition, "so as to ensure the free and ready movement of the piston under the influence of the pressure variations at its opposite sides."

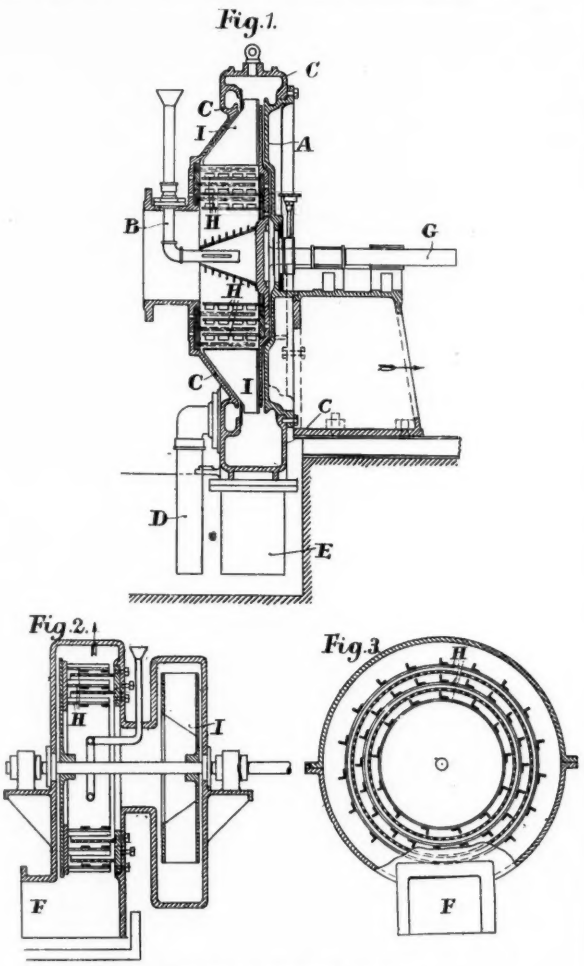
## Centrifugal Apparatus for Purifying, Cooling, and Washing Gases.

THEISEN, H. E., of Munich.

No. 27,417; Nov. 28, 1912.

This is an improvement in the apparatus for purifying, cooling, and washing gases described in patent No. 27,696, of 1911, "which, in addition to a fan, are provided with an atomizing device which increases the action of this member."

The improvements include arrangements to facilitate the renewal of, and access to, the atomizer or like device, by forming the casing in two parts, or dividing it vertically along a horizontal central plane.




**Theisen's Centrifugal Washer.**

Fig. 1 is a sectional elevation of the apparatus combined with a gas-scrubber. In this form of construction gas enters at A and the washing water at B; both the gas and washing water passing radially through the disintegrator apparatus from the inside to the outside. The major part of the washing water is thus thrown against the inclined surface C and deposited in the channel at its periphery and runs off at D. The gas, on the other hand, is "centrifugalled further after the manner of known gas-washing fans," together with the remainder of the washing water, into the spirally enlarged casing—the gas being carried off through a tangentially arranged outlet nozzle (not shown) "in an already known manner," while the remainder of the washing water runs off at E.

In the form of construction according to figs. 2 and 3, the gas enters at F into the annular chamber surrounding the disintegrator apparatus, and first comes in contact with the washing water in the lowermost part, "which water is ejected here from the disintegrating apparatus, whereby it is first preliminarily cooled and purified." Under the action of the fan arranged on the right-hand side, the gas is then drawn (as indicated by the arrows) from all sides equally through the disintegrating device from the outside to the inside in counter-current to the washing water, which is thrown by the action of centrifugal force from the inside to the outside. The washing water itself escapes below at F, while the gas is further centrifugalled in the fan arranged at the right-hand side, together with the washing water carried with it, and, as described in relation to fig. 1, escapes through a tangential outlet nozzle. The washing water, which in any case is separated in only small quantities, is carried off at any suitable place in the casing.

In the apparatus according to fig. 1, one wall of the casing is formed as a cover A, which may be detached, and to which is connected the stuffing box and bearings for the shaft G, which carries a disc on which the rotating cylinders H and the fan blades I are mounted. When the apparatus is taken apart after some fastening screws have been released, the cover, together with the bearings and the bearing bracket, are drawn out laterally on guide-rails in the direction of the arrow. The rotary cylinders H and the fan-blades I are thereby drawn out from the casing C, so that all the parts are easily accessible. This has the great advantage that when the parts are removed the tapering fan casing remains standing on the base or foundation, as well as the pipes for admitting and carrying off the gas and the water supply pipe, and also the pipes for discharging the liquid.

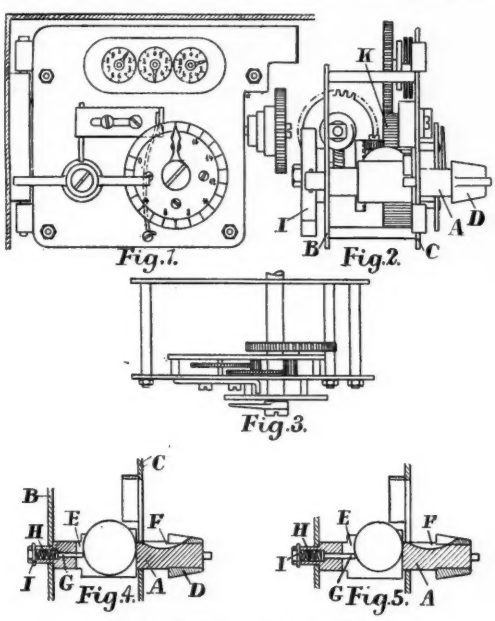
In the forms of construction shown in figs. 2 and 3, the casing is not adapted to be separated along a vertical line but horizontally, after a central horizontal flange arrangement has been duly released.

## Prepayment Gas-Meter.

ROMBACH, P., of Karlsruhe, Germany.

No. 1838; Jan. 22, 1913.

In this prepayment gas-meter the rotary coin-operating shaft is provided with a double coin-slot or slot formed in two parts, of which the outer part is curved in such a manner that the lowest point of the curve is outside the meter casing, so that coins which have not been completely inserted remain in the curve, while coins which have been completely inserted reach the inner part of the slot in the interior of the mechanism and are received into position in the shaft, so that, on the rotation of the shaft, they couple it to the ratchet mechanism.




**Rombach's Prepayment Gas-Meter.**

Fig. 1 is a front view of the mechanism; fig. 2, a side elevation; fig. 3, a plan (some of the parts being omitted); fig. 4, a section through the rotary shaft illustrating the insertion of a large coin in the slot; fig. 5, a similar section illustrating the insertion of a small coin.

The rotary coin operating shaft A is mounted between the walls B and C and provided with a handle D. In addition, there is a transverse slot E and an inlet slot or recess F in communication with the slot E, and of which the lowest part is disposed outside the wall C. In a bearing provided at the rear end of the shaft is inserted a pin G, which projects into the slot E, and is mounted under the action of a spring H, which is carried by a linch pin I.

If a coin is guided by the inlet slot F into the slot E, then, if it is of the correct size for which the mechanism has been adjusted, it is prevented from falling through the latter slot, whereas a smaller coin would fall through and out of the apparatus. On the rotation of the shaft the coin engages with the ratchet mechanism K, and operates it so that a cam I opens the valve. After the movement, the coin falls from the slot E into a suitable receptacle.

If a second coin is inserted before the shaft has been rotated, this second coin first remains in the lowest part of the inlet slot F, and thus shows that there is already a coin in the slot. On the exertion of greater pressure the second coin forces the first one, on the yielding of the pin G, through the slot E, so that it passes through a special channel directly out of the apparatus, while the second coin comes to rest upon the pin G and serves to operate the device.

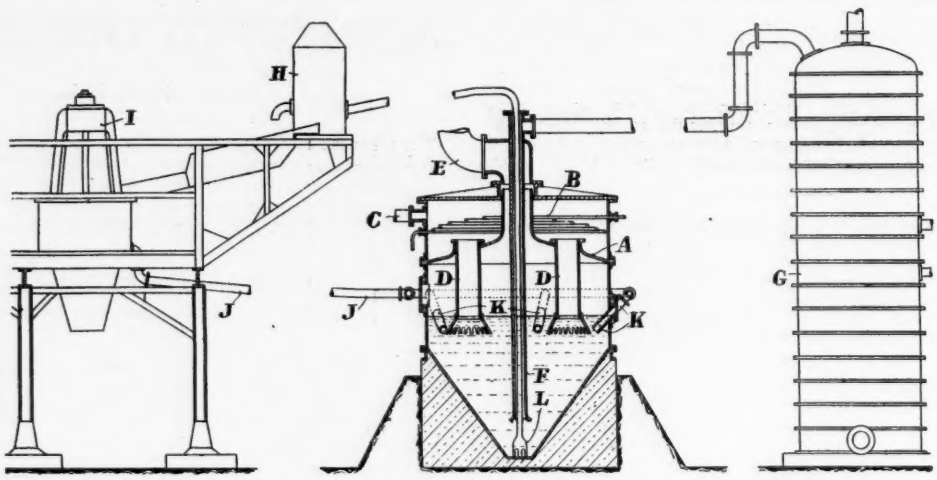
The pin is exchangeable, so that it may be replaced by a longer or shorter one according to the size of coin to be employed. Consequently, one and the same mechanism can be employed for various kinds of coins. Fig. 4 shows, for example, a short pin which serves for use with pennies, whereas fig. 5 shows a longer pin with which a half-penny is employed.

## Sulphate of Ammonia Production.

KOPPERS, H., of Essen-Ruhr, Germany.

No. 834; Jan. 10, 1913.

The invention consists in treating gases in the form of two streams, one of which is introduced into a saturation bath at a part where there is an excess of acid (preferably the place where the fresh acid and mother liquor are introduced); the other stream being introduced into a neutral zone of the same bath (preferably in close proximity to the




**Koppers' Sulphate Saturator.**

place at which the salt is withdrawn). This "ensures the production of salt which is as neutral as possible, without loss of ammonia."

As is well known, the patentee remarks, the usual method of producing sulphate of ammonia in bulk consists in either bringing the ammoniacal gas or the ammoniacal vapours from gas-works liquor into intimate contact with sulphuric acid. When manufacturing in large quantities, however, it is impossible to bring together the sulphuric acid and ammonia in the proportion which corresponds with the chemical reaction represented by the equation :

$$2NH_3 + H_2SO_4 = (NH_4)_2SO_4.$$

The amount of ammonia in the gases varies ; and it is impossible to distribute the sulphuric acid, even with the aid of special mixing devices, with such exactitude that each molecule of sulphuric acid becomes saturated with two molecules of ammonia. In view of the great danger of free ammonia escaping with the gases and vapours, it is always necessary to make the saturation bath slightly acid in order that the whole of the ammonia is retained. There is, however, again the possibility of the prepared salt containing free acid—*i.e.*, of it being acid.

This difficulty is overcome, according to the present invention, by retaining an excess of acid at the part of the bath where the fresh acid and the mother liquor, thrown off by the prepared salt, enter it, and where the gases and vapours deprived of ammonia leave the bath—this excess being sufficient to ensure that all the ammonia in the gases is with certainty retained. By introducing the other part of the ammoniacal gases at (or close to) the place of withdrawal of the salt, the free acid can be completely neutralized, and a neutral salt obtained. At this point the ammonia may also be used in excess, since the risk of loss of ammonia is obviated by an adequate excess of acid.

The (centre) saturation vessel is divided into two compartments by a partition wall A ; the upper compartment containing a coiled heating pipe B, and being joined to a pipe C. Downwardly directed pipes D, provided with flared, serrated mouths, depend from the partition, and the mouths lie somewhat below the surface of the saturation bath. The partition has a tubular neck connecting the lower compartment to the gas discharge pipe E. Passing through the neck is a pipe F, which communicates at the top by a pipe with the distilling column G, and is provided at its lower end with a flared and serrated mouth. Inside the pipe is the suction pipe of an ejector H, adjacent to which is a centrifugal drier I, the discharge pipe J of which leads back to the saturation vessel, and discharges by means of a plurality of delivery pipes K into the saturation vessel close to the level of the liquid in it.

The ammoniacal gases, having been previously freed from tar (and preferably cooled), pass through the pipe C into the saturation vessel above the partition, and are there heated by the coiled pipe B. The gases then pass down the tubes D into the saturation bath, where the ammonia which they contain is absorbed—the gases then escaping through the central neck to the pipe G for further use. The ammonia in the water formed by the previous cooling of the gas is removed in the distilling column G by means of lime and steam. The vapours from the column pass into the inner pipe F, and then into the saturation bath, whereupon, after the removal of the ammonia, they escape with the gases through the pipe E. The prepared salt accumulates at the bottom of the saturation vessel around the bell L, and is raised in the form of a slimy mass by the ejector H, whence it passes into the centrifugal drier, by which the mother liquor is removed. The mother liquor flows through the pipe J back to the saturation bath, where the fresh acid to be added is mixed with it. The mixture enters the saturation vessel by way of the pipes K.

The ammonia is combined in two stages. At the level of the liquid in the saturation chamber in proximity to the mouths below D, where the mother liquor is introduced with the fresh acid, there is a certain excess of acid, which ensures the combining of all of the ammonia passing through at this place. As the salt is withdrawn through the bell L from the bottom of the vessel, the liquid circulates from the top to the bottom ; so that the acid lye containing salt descends to the part where the ammonia is discharged from the distilling column. This saturates the free acid in the lye or salt, so that the prepared salt is kept as neutral as it possibly can be. Owing to the introduction of an excess of ammonia at this part, some of the ammonia remains uncombined. This, however, is not detrimental, since the ammonia must subsequently pass the acid zone, where it will be combined.

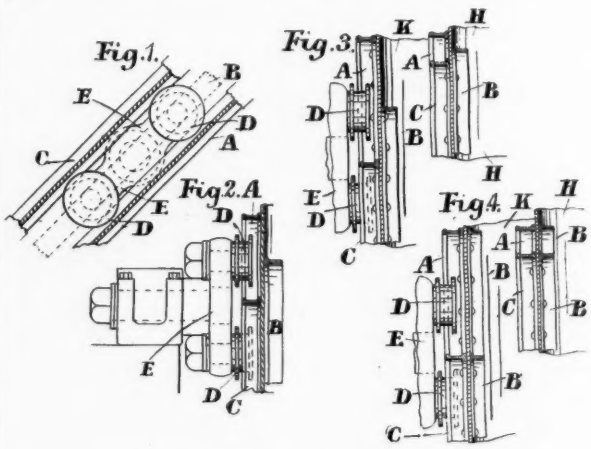
The fact that the vapours from the distilling column are fed to the bottom of the saturation bath is said to have another important result. The resistance in the saturation bath to the passage of the gases therethrough should, of course, be as small as possible, even if only to prevent overloading of the blower moving the gas. These gases consequently pass through the bath with a minimum resistance.

## Gasholders.

R. & J. Dempster, Limited, Beard, G. F. H., and Scott, J. W., of Manchester.

No. 2861 ; Feb. 4, 1913.

The invention relating to spiral-guided gasholders is designed to provide a combination of guide-rails and spiral stays, with guide-rollers of special type.




**Beard and Scott's (R. & J. Dempster's) Spiral-Holder Guides.**

Fig. 1 is a front view, partly in section, and fig. 2 a side sectional view, of an arrangement of rails and stays, between which are a pair of rollers mounted upon a movable yoke or bearing piece, as described in patent No. 20,568 of 1911. Fig. 3 shows, on a different scale, the arrangement of stays and rails employed in figs. 1 and 2. Fig. 4 is a modification of fig. 3.

A is an ordinary guide-rail of spiral form, and B is an internal spiral stay, on the inner face of the holder or lift. In fig. 1, the point of observation is assumed to be such as to make the direction of sight normal to the side of the holder—the observer looking outwards therefrom, so that the stay B is really to the rear of the position from which the sight is taken, and is therefore indicated in broken lines. An additional rail or stay C is shown on the outer face of the holder, and may in the present instance act as a guide-rail, or assist the rail A in balancing the forces upon the flanges of the rollers D under certain conditions of stress during high winds.

The arrangement of rails illustrated renders it possible to employ a single yoke carriage on one side of the rail A, instead of one on each side. With rollers mounted in yoke form as described and illustrated, the combination of rails and stay, or rails and stays, on opposite sides of the sheeting "produces a strengthening result very desirable for large gasholders."

In fig. 3, the stay B is on the inner face of the holder or lift at a position between that of the rails A and C ; but in fig. 4, the stays B are arranged in pairs, or one stay behind each rail. The stays may, as assumed in the drawings, have an angle of spiral equal to that of the guide-rails on the opposite side of the sheeting ; but it is obvious, the patentees remark, that the inner stays might have a slightly different angle of spiral to that of the external rails, so long as they were kept within (or approximately within) the area of the sheeting bounded by the external rails, and thus formed a group therewith.

When a constant angle of spiral is employed for the internal stays and external rails of a spirally guided holder, means may be provided for enabling an inner lift to be always in gear, so to speak, with such

stays. Thus, referring to fig. 3, the cup at the bottom part of the inner lift H may have carriages attached to it, and supporting revoluble tangential rollers either riding upon, or in close proximity to, the sides of the stay B on the outer lift K. The rollers referred to need not actually touch the stay during normal conditions of working, but under abnormal conditions or strain, contact between the stay and rollers gearing therewith would "tend to keep the lift within reasonable limits of movement as regards disturbance out of the plane of the spiral employed."

## APPLICATIONS FOR LETTERS PATENT.

14,477.—Brown, C., and Brown and Barlow, Ltd., "Maintaining uniform pressure." June 23.
14,489.—Keith, J. & G., "Gas-lamps." June 23.
14,490.—Keith, J. & G , "Art of gas lighting." June 23.
14,492.—Stott, V. H., and Schofield, L., "Water-heaters." June 23.
14,549.—Westwood, F., "Reflecting lamps." June 24.
14,567.—British Graetzin Light, Ltd., and Meads, H. J., "Incandescent lamps." June 24.
14,571.—Ovex Fuel Company, Ltd., and Evans, A. C., "Artificial fuel." June 24.
14,591.—Skaupy, F., "Electric gas-lamps." June 24.
14,666.—Brownlow, E. G., and Powell, W., "Valve and tap." June 25.
14,720.—Tillotson & Son, Ltd., and Bamber, W., "Boxes for mantles." June 25.
14,736.—Ferguson, W., "Air-gas plants." June 26.
14,757.—Gas-Zünder G.m.b.H., "Automatic gas-lighters." June 26.
14,773.—Wilton, G., "Purification of coal gas." June 26.
14,792.—Glover, T., "Elbow or bend for metal-pipe flues." June 26.
14,793.—Beadle, C. H., and Pearce, A. W., "Distillation of tar, &c." June 26.
14,798.—Anderson, J., "Valves." June 26.
14,814.—Hughes, G., "Gas-furnace." June 27.
14,826.—Pease, E. L., "Transference of heat between gases at different temperatures." June 27.
14,874.—Traversay, C. G. P. S. de, "Safety devices for gas installations." June 27.
14,902.—Wildbore, J. E., "Incandescent gas-lights." June 28.
14,944.—Dies, C. A., "Pipe-couplings." June 28.

RESTORATION OF LAPSED PATENT UNDER SECTION 20.

Notice is given that an order was made on June 26, restoring the letters patent granted to Hermann Blau for "Improvements relating to the liquefaction of illuminating gas by pressure," No. 2292 of 1909, bearing date Jan. 31, 1908.

APPLICATION FOR RESTORATION OF LAPSED PATENT.

Notice is given that Edward Temple has made application for the restoration of the patent granted to him for "Improvements in, and relating to, washing or purifying apparatus for use in gas-generating plants," No. 25,736 of 1908, bearing date Nov. 28, 1908.

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**Hydro-Electric Breakdown at Toronto.**—On the 16th ult., a serious breakdown occurred in the Hydro-Electric Commission's supply at Toronto, and as a result the city and the towns of Western Ontario using this supply were without electrical energy for a period of five hours. Industrial plants, traction companies, and street and residence lighting were all affected; while in Toronto the water supply ran short owing to lack of pumping power.

**Holyhead and North Wales Gas and Water Corporation.**—At the ordinary general meeting of this Company on the 28th ult., the report of the Directors showed that the net profit for the past financial year was £3086. Adding the amount brought forward (£5745), less the transfer to the reserve fund (£590), and the year's dividend (£2430), there was a total of £5811 at the credit of the profit and loss account. The Directors recommended a dividend at the rate of 3 per cent. per annum, less tax, and the carrying of £660 to the reserve fund, making it £3500. They recorded with regret the death during the year of their esteemed Chairman, Mr. William Jackson, and stated that Mr. Fielding Holt had been appointed his successor. The Chairman, in moving the adoption of the report, said the accounts showed an increase in profits of £64. They had spent £100 less for coal; but they had sold less gas, which was largely accounted for by the fact that during the coal strike the Company asked the public authorities to discontinue the public lighting as far as possible. When he compared the position of the Company at the present day with what it was five years ago, he found it in a much more sound condition. The report and accounts were adopted.

**Wages of Manchester Corporation Employees.**—At the meeting of the Manchester City Council last Wednesday, considerable time was occupied in dealing with the question of the minimum wage for skilled workers. The Workmen's Special Committee had passed the following resolution: "That all men who may hereafter be employed by the Corporation in the engineering and allied trades be engaged at the standard rate of wages recognized by the Associations of Employers and the local organized bodies of workers in such trades in this district." Mr. Higginson moved that the resolution be referred back; and this was seconded by Mr. Hague. Mr. Kay (Chairman of the Gas Committee) said he hoped the Council would not be misled. The Council had no right to do more than private employers in the city in the matter of paying the standard rate of wages. To suggest that workmen employed by the Corporation should start at a 2s. per week higher minimum than that paid by private employers was to introduce preferential treatment, and a form of subsidy very undesirable. Alderman Walker said the employers and the workpeople in conference had agreed to a standard rate of wages, and the Corporation had become parties to the agreement. The recommendation that the recognized standard rate be the Corporation minimum was approved.

# PARLIAMENTARY INTELLIGENCE.

## HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bills brought from the Commons, read the first time, and referred to the Examiners: Blyth and Cowpen Gas Bill, Heathfield and District Water Bill.

Bills read a second time: Bournemouth Gas and Water Bill, Gas and Water Provisional Orders Bill (No. 2), Liverpool Corporation Bill, Silloth Gas Bill, West Bromwich Corporation Bill.

Bills reported: Coventry Corporation Bill, Leicester Corporation Bill, Metropolitan Water Board Bill, Tottenham and Edmonton Gas Bill, Westgate and Birchington Gas and Electricity Bill, York Corporation Bill.

Bills read the third time and passed: Lymm Urban District Council Bill, Mid Kent and East Kent District Water Bill, Swanage Urban District Water Bill.

Bills Royal Assented: Bishop's Waltham Water Bill, Crowborough District Gas and Electricity Bill, Harrow and Stanmore Gas Bill, Herne Bay Gas and Electricity Bill, Mynyddislwyn Urban District Council Bill, Northampton Corporation Water Bill, Porthcawl and District Gas and Electricity Bill, Slough Gas Bill, South Staffordshire Mond Gas Bill, South Staffordshire Water Bill.

The Select Committee to whom the Tottenham and Edmonton Gas Bill was referred found that the petitioners had no *locus standi* before them. The Bill therefore went forward as an unopposed measure.

The Alliance and Dublin Gas Company have petitioned against the Electric Lighting Provisional Orders (No. 6) Bill, in respect of the Kingstown Order.

## HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Lords Bills read a second time and committed: Rochford Rural District Council Bill, Tynemouth Gas Bill.

Lords Bills reported: Leeds Corporation Bill, Llantrisant Gas Bill, United District Gas Bill.

Bills read the third time and passed: Barry Urban District Council Bill, Blyth and Cowpen Gas Bill, Redcar, Coatham, Marske, and Saltburn Gas Bill [Lords].

The Rochford Rural District Council Bill has been referred to a Select Committee, consisting of Colonel Bathurst (Chairman), Sir Edward Beauchamp, Mr. O'Doherty, and Mr. Samuel Samuel, who will commence sitting to-day.

## TOTTENHAM AND EDMONTON GAS BILL.

### Electric Power Company again Frustrated.

### HOUSE OF LORDS COMMITTEE.—Tuesday, July 1.

(*Before Lord* Newton, *Chairman*, *Lord* Langford, *Lord* Charnwood, *Lord* Wynford, *and Lord* Morell.)

This Bill, which has already passed through all its stages in the House of Commons [see "Journal" for June 10, p. 748], came to-day before the above Committee.

Counsel for the promoters, the Tottenham and Edmonton Gas Company, were Mr. Honoratus Lloyd, K.C., Mr. Vesey Knox, K.C., and Mr. Bailey. The only opponent to the Bill (whose *locus* was objected to) was the North Metropolitan Electric Power Supply Company, who were represented by Mr. Balfour Browne, K.C., and Mr. C. C. Hutchinson, K.C.

Mr. Honoratus Lloyd explained to the Committee that the Bill was promoted by the Tottenham and Edmonton Gas Company, and that the main objects of it were to acquire the Enfield Gas Company's undertaking, to which there was no opposition, and to take a transfer of the Electric Lighting Provisional Order granted to the Wood Green Urban District Council in 1902. Clause 40 authorized the transfer of the Order; clause 41 authorized the erection of a generating station; clause 42 provided for an extension of time for the completion of the compulsory works under the Provisional Order of 1902; and clause 44 authorized the Tottenham Gas Company to take transfers of Electric Lighting Provisional Orders in adjoining districts. The one petition against the electric proposals was by the North Metropolitan Electric Power Supply Company; and he was going to submit they had no *locus* to be heard. Counsel then proceeded to explain the circumstances of the transfer of the Wood Green Electric Lighting Order. In 1902 the Urban District Council of Wood Green were granted an Electric Lighting Provisional Order for their district. There was at the same time the North Metropolitan Electric Power Supply Company, who were authorized to supply in bulk to authorized undertakers, such as Wood Green then became under their Electric Lighting Order. In 1902 the Power Company obtained a further Act of Parliament authorizing them to supply electric energy for power purposes within a limited area, which also included Wood Green. The Act also authorized them to supply for lighting purposes where a power supply was given; but the current taken for lighting was not to exceed 25 per cent. of the total consumption. The Company could also supply for lighting purposes in Wood Green with the consent of the Council, which consent was not to be unreasonably withheld. In 1905, the Power Company were authorized to supply for all purposes to the Alexandra Palace, which was within the Wood Green district, and also to supply for haulage and traction purposes, &c. In the same Act the Company were authorized to take transfers of Provisional Orders by agreement, similarly to the proposal now made to the Committee by the Gas Company. In an Act passed in 1897, the Gas Company were authorized by section 28 to apply for Electric Lighting Provisional Orders, and to use their

funds in this connection. In 1902 the Gas Company approached a number of the Urban District Councils in the North of London, including Wood Green, with a proposal to apply for Electric Lighting Provisional Orders for these districts; but on learning that the Councils themselves intended to apply for such Orders, the Gas Company abandoned the proposal. In 1903 the Wood Green Council proposed to put their Order into force, and placed a scheme before the Local Government Board, who, after taking some time to consider the matter, finally decided in 1904 not to grant the necessary loan—he believed for the reason that the scheme was too large. In 1906, the Wood Green Council opened up negotiations, which extended over a period of five years, with the North Metropolitan Power Company for a bulk supply; but in the end they came to nothing. In 1911, the Council suggested to the Power Company that they should take a transfer of the Wood Green Order; but again terms could not be arranged. In November last year, the Board of Trade communicated with the Wood Green Council, calling their attention to the fact that they had had an Electric Lighting Order since 1902, and informed them that unless steps were taken to put the Order into operation, or to transfer it to somebody who would work it, it would be revoked without further notice. What was the position of the Council in these circumstances? They had applied to the Local Government Board and failed to secure a loan; they had negotiated with the Power Company for a supply in bulk without success; and they had suggested a transfer of their Order to the Power Company also without success. Consequently, Wood Green was still without electricity. The result was that the Council had gone to the Gas Company and suggested that it might be in the interests of everybody if they took the Order over, and did on a larger scale what they were already doing in Wood Green—namely, supply gas for the purpose of working generators for the supply of electricity. As a matter of fact, the Gas Company were now supplying to the Alexandra Palace gas by which electricity was generated and used in the palace. There was also a large firm in Wood Green who were supplied in a similar way, and who generated electricity for 38 shops and a music hall. The Gas Company agreed to take over the Council's Order, and, as he had already mentioned, there was only the opposition of the North Metropolitan Electric Power Supply Company, whose only ground for *locus* could be that a new form of competition was set up. He, however, maintained that this was not so. The position was that at present the Urban District Council had the Order, and could erect a generating station and compete with the Power Company. The only effect of the transfer would be that the Gas Company would work the Order and compete with the Power Company instead of the District Council themselves. It might, however, be said that the competition of the Gas Company would be effective, whereas that of the Urban District Council hitherto had not been, but surely this would not give *locus standi*. The question for the Committee to consider was whether a new competition was being set up; and he maintained that, under the circumstances, there was none. It might also be said that the Gas Company were seeking a new power with reference to the transfer of Orders under clause 44, which might put the matter in a different position. Under clause 44, the Gas Company were asking for powers to take transfers of Provisional Orders which had been, or might be, granted in any of the districts within their limits of supply—a power which the Power Company at present had. Here, also, he maintained that no new competition was being created—he was only asking to be put in the same position as the Power Company. As soon as the Gas Company's Bill was deposited, a subsidiary company of the Power Company—the North Metropolitan Power Distribution Company—applied to the Board of Trade for a Provisional Order to supply in Wood Green. The Gas Company opposed this Order when it was considered last autumn, and so did the Wood Green Council. After hearing arguments on both sides, the Board of Trade refused to grant the Distribution Company the Order. Later on, both the Distribution Company and the Power Supply Company petitioned to be heard against the present Bill in the House of Commons; and when the matter came before the Court of Referees the Distribution Company's case was not gone on with, and the Court refused to grant the Power Company *locus*, on the ground that new competition was not created by what was proposed under the Bill. The point the Power Company now desired to raise was that they had certain powers and had spent certain sums of money, and they objected to the Gas Company not only taking the transfer of the Wood Green Order, but taking transfers of any Orders in the future. In neither of these cases, however, was there, in his opinion, new competition created. It might be interesting if he recalled an incident in 1903, when a Bill was promoted for the purpose of enabling a number of local authorities, including Wood Green, to combine and supply electricity in bulk to each district. On that occasion the Power Company objected on the ground that a new form of competition was being created in their area. Mr. Balfour Browne, in speaking in favour of *locus* being granted to the Power Company against the Bill, had stated that, as things then stood, the Wood Green Council had an Electric Lighting Order which they could put into force and create competition which the Power Company were quite willing to face, but the new Bill was bringing into existence a different set of circumstances and a new form of competition. The competition which the Wood Green Council could create under their Order of 1902 was the same now as it was in 1903—the mere transfer of the Order to the Gas Company did not change the circumstances at all so far as the competition was concerned. In the Power Company's petition they repeatedly referred to their objection to the transfer and "revival" of the Wood Green Order; but he impressed upon the Committee the fact that there was no revival, inasmuch as the Order still existed. The point was also raised in the petition as to the anomaly of granting gas companies electric lighting powers. But there were a large number of precedents for this. In 1906, they were granted to Ascot and Brixham; in 1909, to Aldershot and Yorktown; in 1910, to Farnham and Bishop's Stortford; in 1912, to Bognor; and in 1913, to Herne Bay, Westgate and Birchington, and Cromer. With regard to the clause allowing the Gas Company to take transfers of Electric Lighting Orders generally, this was necessary, because their existing powers only permitted them to apply for new Provisional Orders.

Mr. BALFOUR BROWNE, speaking in support of his application for *locus* against the Bill, explained the differences in the two Houses already dealt with by Mr. Honoratus Lloyd on the question of *locus*, and impressed upon the Committee that they were not bound by any decision of the Court of Referees in the other House. He was going to try to convince the Committee that this was an entirely new competition. The powers at present possessed by the Wood Green Urban Council were not only in abeyance, but were absolutely useless, because they could not raise the money to put up a generating station. Their only alternative was to obtain a supply in bulk from the Power Company, apart from any arrangement with the Gas Company. At present there was nobody in the Wood Green area who could give a supply of electricity except the Power Company. Consequently, if this Order was transferred there would certainly be new competition. In the case of the Joint Bill referred to by Mr. Honoratus Lloyd, he informed the Committee that, although the House of Commons refused his *locus*, the House of Lords granted it, and the Bill was amended in consequence. He contended that the introduction of a new body, such as the Gas Company, was the introduction of new competition, and gave him a right to be heard. He could not understand what Mr. Honoratus Lloyd meant when he said that he merely wished to be placed in the same position as the Power Company. Surely this was creating a new competition which certainly did not now exist. He maintained his point that it was anomalous to give electricity powers to gas companies. When the Board of Trade communicated with the Wood Green Council to the effect that they must either put the Order into force themselves or make arrangements to transfer it, the only possible thing contemplated could have been a transfer to the Power Company, as that was the only body which could take a transfer. He therefore claimed *locus* against clauses 40 to 44 of the Bill.

The Committee Room was then cleared, and the parties were re-admitted after about five minutes, when

The CHAIRMAN announced that the Committee had come to the conclusion that *locus* could not be allowed.

The Bill was then automatically referred to the Unopposed Bills Committee of the House of Lords, before whom it came on Thursday, when it was sent forward for third reading.

## MIDDLESBROUGH EXTENSION.

### COURT OF REFEREES—Thursday, July 3.

(*Before Mr.* WHITLEY, *Chairman, Mr.* E. MOON, K.C., Speaker's Counsel, *Sir* WILLIAM BYLES, *Mr.* HILLS, *Mr.* MOONEY, *and Mr.* STAVELEY-HILL.)

The Middlesbrough Corporation, whose area is being extended under a Provisional Order granted by the Local Government Board, which is included in the Local Government Provisional Order Confirmation Bill (No. 18), objected to an application for *locus standi* to appear against the Order by the South Bank and Normanby Gaslight and Coke Company, and by the North Ormesby Gas Company.

Mr. BALFOUR BROWNE, K.C., appeared for the Corporation; Mr. CLODE, K.C., for the South Bank and Normanby Gas Company; and Mr. BAILEY for the North Ormesby Gas Company.

Mr. CLODE, in applying for *locus* on behalf of his clients, said he did so on the ground of competition; but as the circumstances were a little intricate, it would be necessary for him to explain them in some detail. In May, 1866, the South Bank Gas Company was incorporated as a non-statutory company for the purpose of supplying the towns of South Bank and Normanby, in the North Riding of York. In the June of the same year, the Middlesbrough Extension and Improvement Act was passed, under section 35 of which the Middlesbrough Corporation were authorized to supply gas within their own district, and also within the adjoining townships of Ormesby and Normanby; but the Middlesbrough Corporation could not lay mains in any part of Ormesby without the consent of the Ormesby Board of Health. The South Bank Company then applied for a Provisional Order, in which the limits of supply were given as the townships of Normanby and Eston, in the Parish of Ormesby. In 1877, the Company applied for a further Provisional Order, in which the limits of supply were again defined as in the previous Order; and, as far as could be ascertained, these Orders must have been granted with the consent, tacit or implied, of the Middlesbrough Corporation, because the Gas-Works Facilities Act of 1870, under which the powers were obtained, stated, in section 3, that under the Act no powers could be granted for the construction of gas-works except within districts in which there was not an existing company, corporation, body of commissioners, or person empowered by Act of Parliament to construct such works, or to manufacture and supply gas. As he had already stated, when the Gas Company obtained these powers there was in existence under the Middlesbrough Act of 1866 a body of commissioners or corporation already entrusted with powers to supply gas. At the present time, the procedure would be that the granting of the Company's powers would be followed by the repeal of the overlapping powers of the Corporation which existed when the Order was made; but somehow this was not done. It might have been that the Board of Trade thought at the time that the Gas-Works Facilities Act was merely an enabling Act, and not a repealing Act; and that though under this Act the Board could grant new powers, they could not repeal existing ones. However this might be, ever since the Company obtained the Provisional Orders they had been actively supplying gas in the district of Normanby; and, as a matter of fact, the Middlesbrough Corporation had never yet supplied any gas at all in Normanby. Thus the Gas Company were, *de facto*, in possession of the district. Coming to the present extension, what was proposed by the Order against which he claimed *locus* was to take into the borough of Middlesbrough practically the whole of Ormesby, Normanby, and Eston. The Gas Company objected to this, on the ground that it would be such an alteration of conditions in the competition that it would amount to new competition. At present, Ormesby existed as a "buffer state" between Normanby and Middlesbrough; and Middlesbrough could not lay any claims in Ormesby without the consent of the Ormesby Urban District Council. This prohibition was a distinct

protection to the South Bank Gas Company, inasmuch as Ormesby had its own Gas Company, and was not likely to consent to the Middlesbrough Corporation as a second authority coming into the district and laying gas-mains. Now that it was proposed to absorb Ormesby and Normanby into Middlesbrough, this protection would go; and there was every probability that the Middlesbrough Corporation, who would then become the road authority, would proceed to lay gas-mains in Ormesby, and so reach Normanby, and enter into effective competition with the South Bank and Normanby Company, which at present, to all intents and purposes, was impossible, in spite of the fact that the Middlesbrough Corporation had powers to supply. It had been asserted by the Corporation that the prohibition as to laying mains except with the consent of the Ormesby Urban District Council had not been inserted for the benefit of the Gas Companies, and that therefore the Companies could not take advantage of it now in support of their applications. The question having been raised, he was bound to deal with it; and he referred the Court to the Sheffield Corporation Bill last year, where the point was raised as to certain provisions being inserted in a previous Bill with regard to compensation water for the benefit of people lower down the stream. At one time there was no power for anyone to gauge what the compensation water was; but subsequently power was given to the Dunne Navigation Company enabling them to inspect the gauges and see what water was coming down. Last year the Sheffield Corporation had proposed to repeal this provision, and the people lower down the stream applied for *locus* to appear against it. It was then argued that the provision to inspect the gauges had not been inserted for the benefit of the people down the stream, but was put in by agreement with the Dunne Navigation. But the Court held that, inasmuch as the people lower down the stream had the benefit of the proviso, they were entitled to be heard, even though it had not been inserted specially in their interests.

Mr. MOON mentioned to Mr. Clode that it was not necessary for him to show he had a right under the proviso. All he was called upon to do now was to show that there would be a change of circumstances.

Mr. CLODE (continuing) said he had only mentioned it because the point was made against him in the notice of objection to his *locus*.

The CHAIRMAN said that, on the subject of the opening of the roads in Ormesby, he understood the point to be that when the Middlesbrough Corporation became the road authority for Ormesby they would grant themselves the right to lay mains, which at present they might not get from the existing Urban District Council.

Mr. CLODE said that was so. The Corporation would have a direct interest in granting the right to themselves. The mere fact of placing the Middlesbrough Corporation in the position of the local authority for a district in which at present it was practically impossible for them to lay gas-mains altered the conditions in regard to the existing gas companies to such an extent as to entitle him to *locus*.

The CHAIRMAN: Supposing Middlesbrough gets through Ormesby to your area, what is your position?

Mr. CLODE said the way in which his Company would be affected then would be that for the first time they would be faced with competition from their own municipal authority. Hitherto the Company had existed in Normanby on friendly relations with the local Council, lighting the streets, and supplying consumers, without any fear of competition. If this Bill went through, Middlesbrough would be the local authority for Normanby, with powers to supply gas; and the Gas Company's consumers would immediately become ratepayers to Midddlesbrough, and consequently directly interested in the welfare of the Middlesbrough gas undertaking. At the local inquiry, he had suggested that this was a case in which the obsolete gas powers of the Middlesbrough Corporation in Ormesby and Normanby should be repealed. The South Bank Company could never have been competed with in this way under the old conditions; and he hoped to lay before the Parliamentary Committee a proposal either that the Middlesbrough Corporation gas powers in the two districts should be repealed, or that protective clauses should be inserted on behalf of the Gas Company. He would not say much about rate-aided competition, such as this would be; but certainly it was a circumstance which would arise in the district for the first time—that the Gas Company would be rateable by Middlesbrough, and the rates so obtained could be used for the purposes of a rival gas undertaking. Then there was the question of whether the Gas Company would not be entitled to *locus* with regard to the supply of electricity. Middlesbrough now had electric lighting powers under an Order of 1898. Eston and Normanby also had Electric Lighting Orders, which had been transfered to the Cleveland and Durham Electric Power Company, with a right to repurchase. When Middlesbrough became the local authority for these districts, it was open to them to put in operation these repurchase powers; and when this was done, according to the Bill, Middlesbrough could supply the district themselves under the Act of 1898, which, for all he knew, might be different from the conditions of the Provisional Orders the Power Company were now working.

The CHAIRMAN: It is new competition with electricity and gas?

Mr. CLODE said he thought he was hardly justified in putting it as high as that, because he had already been subject to competition with electricity; but the conditions under which the Middlesbrough Corporation could supply under the Act of 1898 might be different from those under which the supply was now given. There had been no proposal from Middlesbrough to purchase the gas-works.

Mr. BAILEY, on behalf of the North Ormesby Gas Company, relied to a large extent on similar arguments to those put forward by Mr. Clode; but he thought he had a stronger point than competition, inasmuch as his Company claimed to be heard as a landowner, for the reason that they were being transferred from one municipal authority to another. He distinguished his position as a landowner from that as a ratepayer, and argued that the transfer from one authority to another would depreciate the value of his property, for the reason that it was elicited from the witnesses at the local inquiry that there would be, after the transfer, an increase in the rates of 4d. in the pound for the next five years, with a subsequent increase to 1s. At the end of ten years, it was anticipated that the rates would be 2s. in the pound higher than at present.

Mr. MOONEY asked how the Company, in their petition, claimed to be a landowner.

Mr. BAILEY said that the petition referred to the gas-works, which could not be erected except upon land, and that consequently the Company must be a landowner.

Sir WILLIAM BYLES said competition did not necessarily imply that the value of the land would be depreciated.

Mr. BAILEY argued that it was not necessary for him, in drafting his petition, to use any particular form of words to indicate his special rights as a landowner, because there had been numerous cases in which the Court had frequently implied from the language used that the petitioner was a landowner.

Mr. MOON said the fact that the burden of the rates might be greater did not necessarily involve depreciation of the land.

The CHAIRMAN asked whether the nature of the competition in the case of the North Ormesby Company was the same as in the previous case.

Mr. BAILEY said it was, with the exception that he was to some extent in a stronger position, inasmuch as the Corporation could not lay mains in Ormesby without the consent of the Local Authority, and, as had been pointed out by Mr. Clode, it was not likely the Local Authority would grant powers to lay mains to a second authority. With regard to buying the North Ormesby Company, the point had been put to the witnesses for the Corporation at the local inquiry, and the reply was that the Corporation would be willing to at once buy up the North Ormesby Company on reasonable terms. The offer was subsequently put to the Corporation that they should carry out this promise, and that the purchase should take place upon terms to be arranged before an arbitrator, but the Corporation now refused to entertain the question.

Mr. BALFOUR BROWNE, replying on behalf of the Corporation, ridiculed the suggestion that the Court should imply, from the fact that these were gas companies, that they were also landowners. If this argument were to be valid, it would be open for any ratepayer to come and say that he was a landowner or an occupier. The whole position was that the proposed extension of the Middlesbrough borough would leave the legal rights exactly as they were at present; and nobody was entitled to *locus* unless he could show that there was something in the scheme which affected his legal rights. With regard to Ormesby, the Corporation got powers to supply gas there before the Company; and it must have been known when the Company was formed that the Corporation had a Bill in Parliament awaiting Royal Assent. Even if Middlesbrough were not extended under the present Bill, the Corporation could supply gas in Ormesby to-morrow, and compete with the Company. The mere fact that the Corporation were to become the local authority in Ormesby did not alter the position, because to-day the Ormesby Council could give consent to the Corporation laying mains. Furthermore, there was not a word about the Gas Company in the proviso which had been referred to, by which the Corporation had to obtain the consent of the Ormesby Council before they could lay mains. If the Gas Company were to have any rights under this clause, surely it must have read that the consent of the Company was to be obtained before Middlesbrough could lay mains.

Mr. MOONEY asked Mr. Balfour Browne whether, in his opinion, by placing the existing gas consumers in these two districts in the position of ratepayers to Middlesbrough, he would not make them participators in the profits of the gas undertaking, and so give them an inducement to take gas from the Corporation—consequently creating new competition with the Companies.

Mr. BALFOUR BROWNE replied that there was the same possibility of competition at present.

Mr. HILLS asked if it were not the fact that, if this Bill went through and the gas consumers in the two districts became ratepayers, they would be induced to take Middlesbrough gas in order to get the benefit of the profits from it.

Mr. BALFOUR BROWNE agreed that they might get profits as ratepayers; but he could not conceive that this was any new competition. It was merely an inducement, in the same way as if the Corporation supplied better gas. Probably what would happen would be that the ratepayers would take gas from the cheapest source.

The CHAIRMAN remarked that the case for the Companies was best represented in capital value; and he asked Mr. Balfour Browne to address himself to this point. The allegation was that, under the powers now being sought by the Corporation, new conditions were being introduced, which would seriously affect the arbitration value of the gas-works.

Mr. BALFOUR BROWNE replied that he did not think the arbitration value would be affected in the least. In any arbitration the point that would be taken into consideration was the competition; and if he agreed to purchase the gas-works by arbitration, the question would be, "What is your maintainable income, and how well is it secured?" The matter would be argued in this way. It would be said that the income was not well secured at all, because the Corporation had the power to supply, and there was possible competition. It was true the Corporation had not supplied in the past; but the arbitrator would be entitled to consider whether there was any probability of such a supply being given in the future, and the consideration would be that there was power to compete with both Companies.

The CHAIRMAN: But is not the competition made more easy by this Bill?

Mr. BALFOUR BROWNE: Only in the one respect that Middlesbrough becomes the local authority.

Mr. MOON expressed the opinion that any arbitrator would say that the chances of this competition becoming effective were greater with Middlesbrough as local authority for the whole area than at present, and that he would give two or three years' less purchase.

Mr. BALFOUR BROWNE said he should rather think that the chances were practically the same, because it was the power to compete now which was the evil of the Company, and that would be argued before the arbitrator as taking away so many years' purchase. It must not be looked at from the point of view that there was a purchase under the present Bill. Finally, dealing with Mr. Clode's argument as to electricity supply, the Corporation could only have the powers now being exercised by the Electric Company transferred to themselves; and he mentioned the case of the Tottenham and Edmonton Gas

Company as a precedent for not granting *locus* on this ground. In the Tottenham case, he said, *locus* had been refused to the North Metropolitan Electric Power Supply Company on the mere ground of a transfer of an Order from one authority to another.

The CHAIRMAN, after deliberation, announced that the Court was of opinion that the change of circumstances was such that the petitioners ought to be heard before the Committee to whom the Bill would be referred. *Locus standi* would be allowed.

## PROGRESS OF SUNDRY PRIVATE BILLS.

The following Bills have recently been considered by the Unopposed Committee of the House of Commons and sent forward for third reading.

*Leeds Corporation Bill.*—A point of interest in connection with the period for the repayment of loans for water-mains was raised in connection with this Bill. It was explained that one of the chief objects of the measure was an extension of time for the construction of waterworks authorized in 1901 and 1907, and to empower the construction of two further conduits. It was found impossible to construct the works already authorized in the period granted—namely, by 1916—and it was now the intention of the Corporation to construct the reservoirs as and when they were required. With regard to the loan period, the Corporation asked for sixty years in which to repay the loan for the new conduits; and the Water Engineer said these mains would be 32 and 42 inches diameter. There were already in Leeds, in efficient working order, many pipes which had been in use for sixty years. These particular pipes were only 18 inches diameter; but there were several other places where mains of 24 inches diameter had been laid for considerably longer than sixty years. Further, the Corporation were granted sixty years for similar works in 1901 and 1907. The Committee decided to grant sixty years.

*Llantrisant Gas Bill.*—This Bill is promoted by the Llantrisant Gaslight and Coke Company, which was incorporated as a non-statutory undertaking in 1865. It was in the ordinary form, and dissolved the limited Company, and incorporated the statutory one. The Local Government Board had reported upon one or two points. First, with regard to the capital. It was mentioned that the present capital of the Company was £3365, whereas under the Bill it was to be £7000. The explanation of this was that the Company had been carried on from 1879 until 1911 without paying any dividend; the whole of the money which could have been distributed in dividends having been utilized in buying freehold land, &c. The Company would have been entitled to capitalize the money so spent out of revenue on capital account, and take 5 per cent. on it. They could have asked for 3 per cent. on the £3365 capital, and 5 per cent. on the amount spent out of revenue; but it was felt that it would be a difficulty in a small company to have two dividends. So they averaged it at 7 per cent, though a small sum was lost in doing so. The Local Government Board were now satisfied on this point. Though the actual selling price to-day was 5s. 5d. per 1000 cubic feet, the standard price in the Bill was 4s. 6d.—actually 11d. below the actual selling price. This was inserted in order to avoid any opposition by the Rural District Council. The Company could not have done this, but for the fact that they were looking to considerable development in a few years' time from a colliery undertaking in the district. For the present it would mean taking something out of the Company by way of dividends, in order to supply at 4s. 6d. instead of 5s. 5d. per 1000 cubic feet.

*Limits of Gas Supply of the Torquay Corporation.*—With regard to the Provisional Order Bill for partially repealing the St. Mary Church Local Board Act, 1868, there are in force in the part of the borough of Torquay comprising the parish of St. Mary Church the unrepealed provisions of the Act as altered by the Torquay Orders, 1884. It is proposed that the gas limits of the Corporation shall be extended so as to include the parish of Kingskerswell. The Bill therefore provides that the gas limits of the Corporation shall be so extended.

*United District Gas Bill.*—As to this Bill, Mr. Lees explained that it is proposed to amalgamate a number of gas-works for purposes of more economical management. The effect of this economy, he said, had shown itself in the price of gas, which had been reduced at all the works to 4s. 6d. per 1000 feet, whereas before the amalgamation the price in one case was 5s. 6d., in two 5s. 5d., and in all the others 5s. About eight local authorities were affected by the Bill, including Buckingham and Bicester; but, no doubt as the result of the economical working of the Company, none of them objected. The standard price was 4s. 6d. per 1000 cubic feet, which was the actual selling price now; and instead of asking for the ordinary 10 per cent. capital, the Company only asked for 9 per cent. There were no reports from any Government Departments. The Banbury Gas Company had had powers since 1865 to supply in three parishes in the districts covered by the Bill; but as the Company had done nothing, it was originally intended under the present Bill to repeal their powers. The Banbury Company, however, threatened to oppose; and as the result of negotiations an agreement had been entered into, which was to be scheduled to the Bill, by which the Banbury Company would supply the United Company with gas in bulk for these three parishes at 2s per 1000 cubic feet, for a period of ten years.

## LOCAL BODIES AND PROVISIONAL ORDER APPLICATIONS.

### Consents Dispensed with by the Board of Trade.

The Board of Trade have made the following reports to both Houses of Parliament, under the Gas and Water Works Facilities Act, 1870, in regard to three applications for Provisional Orders in which they had dispensed with the consent of certain local and road authorities.

### Faversham Gas Order.

The application for this Order was made by the Faversham Gas Company, who sought power to extend their limits of supply and to use additional lands for the manufacture and storage of gas and residual products. The extended limits proposed to be authorized included the parishes of Buckland, Stone, Norton, Doddington, Newnham, Eastling, Throwley, Leaveland, Badlesmere, Goodnestone, Boughton-under-Blean, Dunkirk, Hernhill, and Stalisfield, all in the rural district of Faversham; and the promoters applied to the local authorities of these parishes for their consent to the application for the Order. They were, however, only able to obtain a resolution of consent from three of them—viz., the Parish Councils of Doddington, Newnham, and Dunkirk. But the Throwley Parish Council were the only authority who definitely refused consent; and no objections to the application were lodged by the other authorities. In these circumstances, the promoters requested the Board of Trade to dispense with the consent of the Council and the other local authorities who had not given consent.

The promoters at the same time informed the Board that the Faversham Rural District Council, who had lodged objections against the application for the Order, had withdrawn their opposition subject to the insertion of the following clause:—

> If after the expiration of five years from the commencement of this Order the undertakers have not laid down mains for the supply of gas in any of the parishes referred to in section 6 ("Extension of Limits of Supply") of this Order, and the local authority of such parish, or any company or person, shall be prepared or willing to supply gas within that parish, then the Parish Council or parish meeting of such parish may give to the undertakers notice in writing stating that a supply of gas is required for that parish, and that such local authority or a company or person to be named in such notice as the case may be is prepared or willing to provide a supply therefor, and if the undertakers shall fail, within twelve calendar months from the date of the giving of such notice, to lay down mains for the supply of gas in such parish, the right of the undertakers to have and exercise the powers, privileges, and authorities mentioned and referred to in this section shall, in respect of that parish, cease and determine.

Subsequently the Board were informed that the Goodnestone parish meeting had consented to the application, and that the Boughton and Hernhill Parish Councils and the Norton parish meeting had no objection to the application. The Eastling Parish Council informed the Board that a supply of gas would be a great convenience to their parish and protested against the six years' limit allowed by the clause. All the authorities concerned were invited to attend an inquiry at the offices of the Board; but none of them were represented.

In these circumstances, the Board decided to grant the Order applied for, subject to the insertion of the above-mentioned clause and of various other amendments which appeared to be desirable, and to dispense with the consent of the local authorities from whom no resolution of consent had been received.

### Penistone and District Gas Order.

The application for this Order was made by the Penistone, Thurlstone, and Oxspring Gas Company, who sought power to raise additional capital and to extend their limits of supply. Objections to the application were lodged by the Great Central Railway Company, the West Riding County Council, the Penistone, Thurlstone, Gunthwaite and Ingbirchworth, and Hoylandswaine Urban District Councils, and the Hunshelf and Thurgoland Parish Councils. The promoters agreed to insert clauses for the protection of the two first-named objectors, and their objections were accordingly withdrawn.

Having failed to obtain the consent of the Gunthwaite and Ingbirchworth Urban District Council, the Hoylandswaine Urban District Council, and the Hunshelf and Thurgoland Parish Councils, all of whose districts and parishes they wished to include in their limits of supply, the promoters asked the Board to dispense with the consent of these authorities. Accordingly the Board appointed the Hon. T. H. W. Pelham to hold a local inquiry into the matter.

At this inquiry, the promoters arrived at an agreement with the Thurgoland Parish Council, who subsequently forwarded their consent to the application. With regard to the outstanding objections, the Gunthwaite and Ingbirchworth Urban District Council and the Penistone and Thurlstone Urban District Councils objected to the inclusion of the first-named urban district within the promoters' limits of supply; and the Board decided not to include that district in the limits authorized by the Order.

The Hoylandswaine Urban District Council and the Hunshelf Parish Council objected to the inclusion of their areas within the limits, on the ground that the promoters were unlikely to supply them with gas in the near future, and that there were other companies from whom they could more conveniently obtain a supply. The Board decided, as the urban district of Hoylandswaine includes an outlying portion of the town of Penistone, and in view of the fact that the promoters propose to lay mains along a road in this area, to include in the limits such part of the urban district of Hoylandswaine as lies to the south-west of the Huddersfield and Penistone branch of the Lancashire and Yorkshire Railway and to dispense with the consent of the Hoylandswaine Urban District Council as regards that part of their district. Similarly, as the main road connecting Penistone with Thurgoland runs through the parish of Hunshelf, and in view of the fact that the Thurgoland Parish Council desired to obtain a supply of gas from the promoters, the Board decided to include in the limits of supply such part of the parish of Hunshelf as lies to the north-east of the main line of the Great Central Railway from Sheffield to Manchester, and to dispense with the consent of the Hunshelf Parish Council as regards this part of their parish.

### West Staffordshire Gas Order.

The application for this Order was made by William Emery Pickering (trading under the name of the Brewood Gas Company), who sought power to maintain and continue existing gas-works, and to manufacture and supply gas within the parishes of Brewood, Lapley and Wheaton-Aston, Stretton, Church Eaton, Gnosall, and Haughton, and part of the parish of Blymhill, in the county of Stafford. Objections to the application were lodged by the Staffordshire County Council, the Gnosall Rural District Council, and the Lapley and Wheaton-Aston and Blymhill Parish Councils. The Brewood Parish Council consented to the application.

The Staffordshire County Council gave their consent to the application on the promoter agreeing to insert a clause for their protection,

Having failed to obtain the consent of the Cannock, Gnosall, and Shifnal Rural District Councils, the Lapley and Wheaton-Aston, Gnosall, Haughton, Blymhill, and Church Eaton Parish Councils, and the Stretton parish meeting, the promoter asked the Board to dispense with these consents; and the Board held an inquiry into the matter at their offices.

None of the local authorities availed themselves of the Board's invitation to attend the inquiry. The Lapley and Wheaton-Aston Parish Council stated, in a letter to the Board, that they objected to the inclusion of their parish in the limits of the Order on the ground that they wished their rates to be kept as low as possible, and that the laying of the mains would damage their roads, which had been recently repaired. None of the other local authorities gave any reasons for withholding their consent.

In these circumstances, the Board decided to dispense with the consent of the above-mentioned local authorities, but inserted in the Order a clause to the effect that, if the promoter failed to provide a supply of gas to any parish in his limits of supply within three years, any person or local authority should be permitted to apply for power to supply gas in his stead.

# LEGAL INTELLIGENCE.

## DAMAGE CAUSED BY BURST WATER-MAINS.

### A Question of Liability.

Towards the close of last month, Mr. Justice SCRUTTON had before him, in the King's Bench Division of the High Court of Justice, an action brought by the Charing Cross, West End, and City Electricity Supply Company, Limited, against the Hydraulic Power Company, to recover the sum of £717 4s. 1d. for damages caused to their underground pipes and works through the bursting of the defendants' mains in the neighbourhood of Cannon Street, E.C., on three days in February and one day in August last year. The defendants denied liability, and pleaded certain legal points.

Mr. M'CALL, K.C., and Mr. C. B. MARRIOTT appeared for the plaintiffs; Mr. J. Sankey, K C., and Mr. F. GOVER represented the defendants.

Mr. M'CALL, in the course of his remarks in opening the case, said that on each of the occasions mentioned the water from defendants' mains escaped in large quantities with great force, and caused serious damage to plaintiffs' mains, cable connection boxes, &c., which necessitated extensive repairs, the cost of which was now claimed. The defendants said that plaintiffs laid their pipes at their own risk, and subject to the rights of the defendants to maintain and use their own mains. They denied negligence, and said the bursts, if any, were caused by subsidences, in some cases contributed to by the plaintiffs' own works, which impaired and disturbed the defendants' mains. These were charged with water at a pressure of some 700 lbs. per square inch; and any escaping was certain to do extensive damage. The plaintiffs' pipes, &c., were laid in 1892, and in all cases were put down under the supervision and with the approval of the defendants' Engineer. There were a considerable number of bursts prior to 1912; and it would be found that there were a large number of cases in which, when a burst took place which injured plaintiffs' mains, the defendants recognized their liability, and paid damages. In conclusion, he submitted that the liability of the defendants was clearly laid down by the decided cases.

Mr. SANKEY said his case was that plaintiffs had by their own works interfered with and broken up the foundations of defendants' mains, and so caused the fractures. They had given in the "particulars" details of how this had been done.

A great deal of evidence was called on both sides; and Counsel argued at length the legal points raised in the case, and quoted many authorities. Eventually judgment was reserved, and it was delivered last Saturday.

His LORDSHIP first dealt with the facts in regard to each of the bursts, and said he found that they were due to subsidence of the soil above, owing to vibration caused by the heavy traffic, and that the defendants' mains had nothing to do with them. The pleadings alleged that the defendants' pipes were of insufficient strength, in that they were of cast iron instead of steel, and that the joints were too rigid. He was satisfied that the pipes and joints were of sufficient quality, and were in accordance with first-class hydraulic engineering practice; and that while later experience might render it desirable to employ steel in some places, in view of the heavier traffic now using the City, he was satisfied that it was not negligent to use the pipes and joints now employed. He thought the bursting of the pipes put upon the defendants the burden of accounting for it; and that, unexplained, the bursts were evidence of negligence. Defendants satisfied him that the pipes which burst were sound and of sufficient strength, and that the bursting was due to subsidence of the soil, which they did not cause, and which they could not, by reasonable care, detect. They looked out for leakage, and watched the surface for subsidence; but they could not be continually opening the streets of the City to see that all was going on properly underneath. He therefore found that the defendants were not guilty of any negligence in the construction of their system or in its working. On this finding, they contended that they were not under any liability, and that before the plaintiffs could succeed they must establish negligence. The cases cited bound him to decide that the defendants, who had brought into the road, for their own profit, a dangerous thing—viz., water at a very high pressure, so that if it escaped it did enormous damage—were liable for escapes, even without negligence. He therefore held that the defendants were liable for the amount claimed, with costs. The same measure of justice would also apply to the plaintiffs in regard to escapes from their mains and any damage caused thereby.

## "Holophane" Managing Director's Wrongful Dismissal.

In the King's Bench Division of the High Court of Justice, Mr. Justice Bailhache and a Special Jury were occupied for several days in hearing an action brought by Major Geoffrey Carr Glyn, of Sharnbrook, Beds., against Holophane, Limited, for damages for alleged wrongful dismissal by the Company from the position of Managing-Director. The defendants alleged that, owing to misconduct by plaintiff, they were justified in dismissing him; their allegation being that he placed a number of "Dilux" glass light shades into their stock, and sold them as "Holophane" shades. It appeared that the Company bought out a competitive German firm who sold a shade called "Dilux," which was practically similar to the "Holophane" shade, though inferior in quality; and the suggestion was that the plaintiff ordered the stock to be mixed with the other stock and sold as "Holophane." Plaintiff emphatically denied that the "Dilux" ware was inferior, and alleged that all he did he did with the full knowledge of the Board. Without leaving the box, the Jury found for the plaintiff, awarding him damages amounting to £400, which was equivalent to six months' notice to terminate his agreement. Judgment was entered for him, with costs.

## Capital of the Colonial Gas Association, Limited.

In the Chancery Division of the High Court of Justice last Tuesday, Mr. Justice Neville heard a petition presented by the above-named Company asking the Court to approve a scheme under section 120 of the Companies Act, and to confirm resolutions for the consolidation of capital under section 45 of the Act. Mr. Stamp said the Company was formed to carry on business in Australia; the capital consisting substantially of ordinary shares, although there were also 60 founders' shares of £10 each. By the original constitution of the Company, the founders' and the ordinary shares, of which 49,860 of £5 each had been issued, were to rank *pari passu* in dividend until they had received 8 per cent.; and when above this half was to go to the founders and half to the ordinary shareholders. The dividends had never reached 8 per cent.; and it was now proposed that each of the founders' shares should be divided into two shares of £5 each, and that they should be consolidated with the ordinary shares, so as to make a uniform Company of 50,000 shares of £5 each. As a *solatium* to the founders for loss of possible future interest in half of the profits over 8 per cent., it was proposed to give them £600 out of the reserve fund, which could not be done except by a scheme under section 120. The fund now amounted to £8000; and the founders would each receive £10. The creditors were not in any way affected by the proposal. The resolutions had been passed by the ordinary shareholders with one dissentient; and at the meeting of founders, 54 out of the 60 were represented, and the scheme was unanimously confirmed. His Lordship sanctioned the scheme, and confirmed the resolutions.

## Validity of Verbal Notice to Workmen.

At the Westminster County Court, on Monday last week, his Honour Judge Woodfall had before him a claim made by two workmen, named Crispin and Robinson, against the Gaslight and Coke Company for a week's wages in lieu of notice terminating their employment. The evidence given in support of the claim was that prior to the Company acquiring the Stratford Gas Company's works it was the practice of the latter Company to give their workmen a written weekly notice, and that this practice had been continued by the purchasing Company until last year, when it was discontinued. Towards the end of the plaintiffs' employment last December, the Company gave them a verbal week's notice; but they claimed to have a written notice, in accordance with what they alleged was a custom. His Honour, in giving judgment, said the first question was whether any notice had been given to the two workmen by their employers; and he could not come to any other conclusion than that there was. Therefore he had to determine whether it was a sufficient notice. He did not doubt that there had been a practice to give a written notice; but two observations arose. One was that the employer was not the Gaslight and Coke Company, but another who chose to carry on his business in a different way; and the other was that there was no legal obligation on employers to give their workmen written notice. Though this practice might be convenient in some cases, he could quite understand that it was not so in the case of a Company having some 14,000 employees; and the Gaslight and Coke Company had discontinued it. He therefore came to the conclusion that the plaintiffs had proper notice to terminate their employment. Then there was a question whether there had been a waiver of the notice by reason of the fact that after notice the plaintiffs had been taken off work for which they had been paid weekly wages, and given work in the yard for which they were paid daily, and then sent back to their ordinary work for a day or two. He was of opinion that it was not the quality of the work that fixed the employment; and he thought it was impossible to hold that, because the men were first employed at weekly wages, then given a week's notice, then paid as daily workers in the yard, and afterwards put to their ordinary work for a short time, they were entitled to another notice. He could not help thinking that the whole cause of action was the difficulty which had arisen as to a written notice, which the men said they had been accustomed to receive for many years previously, and which they honestly believed they were entitled to demand. In his opinion, a verbal week's notice was a perfectly good one; and therefore the claim failed. Costs were not asked for by the Company, who merely desired to have a decision on the principle of the validity of the verbal notice.

**Stockport and the Absorption of Heaton Norris.**—A decision has just been given by a Parliamentary Committee on a Provisional Order Bill, by which Stockport will take over the government of Heaton Norris. The question of its acquisition by Manchester or Stockport has been much discussed in the district for some time; and this decision settled the matter. In the course of the inquiry, it was stated that something like 75 per cent. of the ratepayers and property-owners were in favour of remaining as they were.

# MISCELLANEOUS NEWS.

## THE RETIREMENT OF MR. JAMES W. HELPS.

### A Valedictory Letter.

The "Editorial Notes" in the number of the "Croydon Co-Partner" for the current quarter are preceded by a letter from Mr. James W. Helps, addressed to his "dear friends and colleagues" in the Company from whose service he has just retired on account of ill-health. It is accompanied by a photograph of the writer, and is as follows:

Dear Friends and Colleagues,—It was in the early part of March, 1884, on the 11th, to be exact—that an advertisement appeared in the "Gas Journal," inviting applications for the post of Engineer and Manager of the Croydon Commercial Gas and Coke Company. At the earnest suggestion of my late father, I applied for the position, though I believed that a young man, hailing from so small and comparatively unknown a place as Weston-super-Mare, was hardly likely to have much chance of success. Imagine, therefore, my surprise and delight when, on the afternoon of March the 19th, I received a telegram, followed by a letter—which I still possess and prize—from Mr. W. J. Russell, the then Secretary of the Croydon Gas Company, informing me that I was one of the six selected to appear before the Directors on the following Saturday. I shall not easily forget the feelings with which I entered the Board-room on that, to me, eventful day, nor the surprise, which I think was shared by the other five applicants, when, after an anxious hour or so spent while the matter was being discussed, the Secretary announced that my presence was desired a second time. Suffice it to say that when this interview was over I left the room with the great satisfaction of knowing that my application had been successful; and I did not take long in sending telegrams to my wife and my father announcing the good news. I have ever felt that one of the most valuable assets connected with my application was a very kindly worded letter of introduction to Mr. H. P. Stephenson, one of the Croydon Company's Directors, given to me by Mr. (now Sir) Corbet Woodall, under whose brother I had previously served in Leeds for over four years.

It was, however, not till Monday, June the 16th, 1884, that I formally took up my appointment, though on the previous Saturday I had the privilege of assisting the Company's cricket team in their match against the eleven of the Corporation of Croydon. Well, the gasholders at Waddon have been filled and emptied a great many times since that day; and the time has unfortunately now arrived when, in my official capacity, I must say farewell to all those who have so loyally shared with me the work of bringing our Company to its present successful and important position.

Since I first took up my residence in the house no longer existing, but which until a few years ago stood at the main entrance to our works, I have seen many changes, and have, of course, experienced times of trouble and anxiety. But in all my difficulties I have ever been helped and cheered by the unvarying sympathy and consideration of the Directors, and the utmost loyalty and assistance, not only of the staff and workmen under my immediate control, but of the officials and employees of the Company in all departments. How can I ever hope to sufficiently thank the Directors for their generous and sympathetic treatment when times of illness (alas too frequent) overtook me, and more especially when the question of my retirement was being considered? How can I adequately acknowledge the splendid way in which my Chief Assistant, those under him, and the workmen generally, did all in their power to lighten my work at such times, and to prove to the Directors, by increased attention to their duties, that the interests of the Company should not suffer during my absence? It is equally difficult to find words in which to convey to the Secretary and his staff, to the Chief of the Distribution Department and those working with him, my deep appreciation of the continued efforts they made in the same direction.

The twenty-nine years (exactly one half of my lifetime) which I have spent in the Company's service, although at times mingled with sorrow, have been very happy ones. I have had the pleasure of working with a splendid body of men who have never given me more than the most trivial cause for anxiety; and I have the pleasure of believing that they have always looked upon me not only as their master, but as their friend. I have been associated with them in their play as well as in their work; and in both I have ever received at their hands the greatest courtesy and regard. And now that we have come to the parting of the ways, it is difficult—nay, almost impossible—to find expressions for the feelings which well nigh overcome me. I can only say, "Good-bye, God bless you." May you all continue to work as loyally and successfully under the new conditions which have arisen as you ever did while I had the honour of acting as your Chief; and may you prove to the Directors who have always been so kind and considerate to you, and to the shareholders who trust you, that as co-partners in their great concern you are determined to make the affairs of the Croydon Gas Company run on even smoother and more successful lines in the future than they have done in the past.

I am, Yours always,

*June* 30, 1913. (Signed) J. W. Helps.

## AUSTRALIAN GASLIGHT COMPANY.

### Increase of Capital.

A Special General Meeting of the Australian Gaslight Company was held in Sydney, on the 2nd ult.—Mr. G. J. Cohen presiding.

The Secretary (Mr. R. J. Lukey) having read the advertisement convening the meeting,

The Chairman briefly explained the reason for holding the meeting.

HOT WATER TEXTS. No. 5.

What is known as 'intercirculation' is a trouble easily obtained if a gas boiler is not connected up properly. When a circulator is connected up to the pipes from a range boiler this trouble will often throw the circulator out of action by causing the thermostat to close the gas-way before the store of water is hot. We issue reliable working diagrams dealing with this trouble and many other vital points.

JOHN WRIGHT & CO.,
"Hot Water Department,"
19-21, Queen Victoria St.,
LONDON, E.C.

HOT WATER TEXTS. No. 6.

For the maximum of efficiency in supplying Hot Water for all domestic purposes, where an existing Hot-Water system with separate tank or cylinder is in use, the boiler must be WRIGHT'S CALEFACTOR.

JOHN WRIGHT & CO.,
Essex Works,
BIRMINGHAM.

He said the natural extension of the Company's business during the last few years had greatly outgrown the subscribed capital. The Gas Act of 1912 provided that after July 1, 1913, all issues of shares by gas companies in the State of New South Wales should be "offered for sale by public auction or tender." It therefore became necessary, in the interest of the shareholders, that the opportunity afforded for securing any increased capital should be taken advantage of before the end of June. Not only had the subscribed capital of £1,275,000 and the £300,000 debentures been fully absorbed, but short loans to the extent of nearly £300,000 had also had to be obtained to meet the Company's requirements. It was with the intention of repaying a portion of the latter amount, and to meet the expenditure for additional plant, main, and service-pipes, &c., to cope with the business, that the Directors decided upon their present action. He wished the shareholders fully to understand that the "C" shares to be created could only carry a dividend not exceeding 7 per cent. per annum, and were also subject to the regulations governing the price of gas and payment of dividend under the "sliding-scale" provided in the Act. In view of the annual meeting of the Company in July, he would not enter more fully into the matters affecting the general interests of the Company, but simply move the resolution authorizing the new issue of capital. He concluded by submitting a resolution sanctioning the creation of 42,500 additional £6 shares, to be offered at par to shareholders, in the proportion of one new share for every holding of five shares.

Mr. W. C. GODDARD seconded the motion, and it was carried.

## SOUTH METROPOLITAN GAS COMPANY'S CO-PARTNERS.

### Another Bonus.

The opening article in the current number of the South Metropolitan Gas Company's "Co-Partnership Journal" bears the signature of the Chairman of the Company—Mr. Charles Carpenter, D.Sc., M.Inst.C.E.—who addresses his co-partners as follows.

Following the custom of many years, the month of July brings with it the pleasing task of declaring the co-partnership bonus for the year just completed. The amount, as all our co-partners know, depends upon the price at which we have been able to sell our gas during that period; and there have been few occasions when the help of our partnership was more needed to make expenditure balance income. We have not been able to do this; but by drawing heavily upon our money balances we were able for the time being to get through without raising the price of gas. The bonus, therefore, will be at the same rate as before—namely, 8¼ per cent.—and will amount to about £45,000 for the year.

Now, this is a very large sum, and both our gas consumers and our shareholders are entitled to an answer to the following inquiry concerning it: "You probably make as a first charge or obligation in carrying on your business the payment of full and liberal wages to your workpeople. In addition they receive other privileges, such as holiday and pension, which compare favourably with every other employment, whether under Government or otherwise." Then comes the question, "Are you entitled to take a further sum of about £45,000 from the profits, and divide it among your employees?" The answer is: We have adopted such a policy for the last quarter-of-a-century, with results which we believe justify its continuance. The payment of wages alone in return for services rendered has not been found conducive in the past to the attainment of the best economic results. No inducement was given to the worker to do more than he was obliged. He took little or no interest in the fortunes of the business with which he was associated, and the mental help he might have given to its progress was uncalled on and unutilized. A Yorkshire millowner said to a visitor whom he was showing over his mill: "If my workpeople were to be careful and avoid waste, they might save me £4000 a year." The friend replied: "Why don't you give them £2000 a year to do it? and then you would be the richer by £2000 a year."

This is the principle upon which our co-partnership is founded. We recognize that there is all the difference in the world between the willing and interested worker, scheming to save time and materials, and one who takes no heed or care about the progress of the undertaking which provides his means of livelihood. It is out of the profits provided by the extra care, diligence, and intelligence exercised by our employees that we are able to credit them with an extra £45,000 a year over and above their salaries and wages. By economical working and the avoidance of wastefulness in any shape or form, our endeavour is to sell gas at the lowest possible price, and thus augment the facilities for its use by those to whom economy is of moment, as is the case with by far the largest number of our consumers. It cannot be too clearly borne in mind that cheap gas means increase of consumption, and increased consumption means more employment of labour.

"What becomes of the bonus?" is a question often put. The idea is, of course, that it should be applied to the purchase of shares in the Company's business, supplemented by the savings, great or small, which can be added. It is satisfactory that the number of employees holding £100 of stock and upwards is steadily increasing; as a matter of fact, it is nearly double the figure of five years ago. This shows what can be done in spite of the loss to us of those who, having accumulated a substantial nest-egg, leave our service to seek employment in the Colonies or elsewhere. Some of the bonus is invested as a substitute for house rent, as witness a letter lately received from one of our workmen who decided to take his pension at the age of sixty years, leaving London to "keep a little freehold cottage of my own warm, thanks to co-partnership and our Building Society." I have heard somewhere or other a refrain running something like this: "Every little bit, added to a little bit, makes just a little bit more." This might be well described as a song of thrift; and it is the thrifty workman we want, for he will do himself more justice and the Company more credit than the careless one who takes no other thought than for the present.


# "Main Merits."

Familiarity with the "Main" Cookers begets confidence in their merits. They represent the highest attained degree of workmanship and quality.

They appeal to the practical man because of their efficiency, the simplicity of their design, and the accessibility and strength of wearing parts.

While making more and more new friends every season, they retain their hold on the affections of old friends.

## R. & A. MAIN, LIMITED.

**WORKS:** Gothic Works, EDMONTON, N.; Gothic Ironworks, FALKIRK; and Gothic Works, BIRMINGHAM.

**SHOW-ROOMS AND BRANCHES:** 25, Princes Street, Oxford Circus, W.; 136, Renfield Street, GLASGOW; 56, Broad Street, BIRMINGHAM; 83, Old Market Street, BRISTOL; 13, Whitworth Street West, MANCHESTER; 8, Exchange Place, Donegall Street, BELFAST; 333, Queen Street, MELBOURNE; and 12, Cunningham Lane, Pitt Street, SYDNEY, N.S.W.

## BELFAST GAS-WORKS EXTENSIONS.

The subject of the extension of the Belfast Gas-Works was under consideration at the last meeting of the City Council.

Alderman CRAIG, in moving the adoption of the Gas Committee's minutes, said it had been resolved that £46,250 of the amount standing to the credit of the reserve fund should be invested by taking up £50,000 of the Corporation 3½ per cent. stock of September, 1912, for the purpose of the gas undertaking. The Gas Engineer and Manager (Mr. J. D. Smith) had reported that it was necessary that preparations should be made for providing additional carbonizing plant of the vertical type; and he recommended that an installation capable of producing 5½ million cubic feet of gas per day should be put in hand, with a view to having a 2¾ million section completed for the winter of 1914—the second section to be ready as soon as possible afterwards. He also recommended that one of the gasholders, the capacity of which was 1 million cubic feet, should be demolished. He thought a spiral-guided gasholder of 2 million cubic feet capacity should be erected. He also wished to introduce a coke and ash washing plant. In view of these alterations and additions, the Engineer suggested that a deputation should be sent to England to inspect the most modern types of plant, as he was naturally anxious to see if any improvements had been made in vertical retorts since the last bench was completed—improvements not only in the make erected last year, but also in all vertical retorts worked on the continuous system. Accordingly, a deputation had been appointed to visit the gas-works at Liverpool, Manchester, Birmingham, Hull, and Hebden Bridge.

Mr. SQUIRE, in seconding the motion, said the Council would be asked to deal with some very important matters in the near future. The Committee had already put down vertical retort plant with a productive capacity of 2½ million cubic feet of gas per day; and later on they would be asked to extend the provision made in this direction.

The minutes were adopted.

In connection with the additions to the gas-works, Mr. J. H. H. Swiney, Arbitrator for the Local Government Board for Ireland, held an inquiry into valuations, titles, and other matters affecting claims of property owners. Mr. J. H. Robb, B.L., objected to the proceedings, on the ground that certain maps, &c., had not been deposited; but Mr. T. Harrison, B.L., for the Corporation, held that all obligations had been complied with. The inquiry lasted several days.

## OLDBURY GAS UNDERTAKING.

### Annual Statement of Accounts.

The statement of accounts of the Gas Department of the Oldbury Urban District Council for the year ended the 31st of March last has been issued by the Engineer and General Manager (Mr. Adam Cooke). It shows that the quantity of coal gas made was 148,010,000 cubic feet, and of water gas 12,462,000 cubic feet; making a total of 160,472,000 cubic feet. The gas sold by meter was 136,150,200 cubic feet; consumed by the public lamps, 18,200,000 cubic feet; used on the works, &c., 1,279,800 cubic feet—total, 152,630,000 cubic feet. The gas unaccounted for was 7,842,000 cubic feet, or 5·1 per cent. The quantity of gas made per ton of coal was 12,478 cubic feet. The amount received from the sales of gas, less discounts and allowances, was £15,690; the income from residual products was £6423; and from gas-fittings, £187—the total receipts being £22,355. Gas manufacture cost £13,826; distribution, £1524; rents, rates, and taxes came to £1430; and management cost £460. The total expenditure was £18,139. The gross profit was £4216, and the net profit £1224. The loans repaid during the year amounted to £974; and the balance set aside to provide for repayment of loans was £3013. With the sum of £8208 brought forward, there is a balance of £9432 to carry to the next account.

The annual accounts were presented at a meeting of the Council held last Friday evening, and gave rise to some discussion.

Mr. LINIE reminded the Council that at their last meeting the Manager refused to give them the cost of the manufacture of gas at the Oldbury works; and he submitted that, as an employee, the Manager was bound to give the Council the information if they desired it.

Mr. J. W. WILSON, M P., said the matter had been raised very often; but, from a business point of view, the Gas Committee always considered it was one of the things they should not make public. As long as the Council trusted the Committee, it was in the best interests of the ratepayers that the cost of making gas should not be given. If any individual member of the Council wished to understand the position better, his first step should be to get added to the Committee next year. If he could not wait till then for the information, he (Mr. Wilson) was quite sure the Chairman, the Manager, or any member of the Committee, would be glad to have a talk with him on the subject.

The CHAIRMAN (Mr. H. Jeffries) said he did not think the Manager meant to be disrespectful in his refusal to give the information; and he should prefer to have the matter discussed when he was present. As Mr. Cooke was absent through indisposition, he suggested that the subject should be introduced at the next meeting.

After some further remarks,

Mr. THOMLINSON (Chairman of the Gas Committee) said if Mr. Linie or any member of the Council would see Mr. Cooke personally and have a talk with him, he would no doubt furnish the information required.

The matter was then deferred until Mr. Cooke was present.

Mr. JONES gave notice to move a resolution at the next meeting to the effect that the price of gas for power purposes should be increased from 1s. 4d. to 1s. 5d. per 1000 cubic feet, owing to the advance in the cost of fuel.

## ILKESTON GAS MANAGEMENT.

### Mr. F. C. Humphrys Vindicated.

After a series of tergiversations, which had left matters in a ludicrously illogical state, the Ilkeston Corporation have done justice to Mr. F. C. Humphrys, for many years the Manager of the gas undertaking. It was inconceivable that the case could be allowed to rest where it was left at the June meeting of the Council, as reported in the "JOURNAL" for the 24th ult. Mr. Humphrys' explanation then made it clear that, in regard to the official action which preceded the construction of the new spiral-guided holder which was partially demolished in January of last year, responsibility rested with the then members of the Committee and the late Town Clerk. Mr. Humphrys had been too long content to vicariously bear the burden of criticism, and his statement recently forthcoming put the matter in its true light. Following the unpleasant incidents of the past few months he had tendered his resignation of the secondary post of assistant-engineer to which he had been appointed; and the proposal to vote him £400 as a *solatium* was recognized by those most intimately acquainted with the circumstances as a not too substantial compensation, after the best part of a professional lifetime had been spent in the service of the Municipality. But the upshot of the deliberations last month was to leave this tardy compensation unauthorized, with the result that, deprived of office and emolument, Mr. Humphrys had been placed in a completely unmerited position. As to whether this action was the result of irritation to which his clear statement had given rise, it is not necessary here to inquire. In the sense of that which is equitable as to the treatment of responsible officials, it is at this period more acceptable to record that some amount of justice has at last been meted out, and that Mr. Humphrys' position has been vindicated. The Council could do no less than admit their mistake; and, in effecting his reinstatement as assistant to the newly-appointed engineer, they have judiciously availed themselves of the advantage of the continued service of one whose work in past years has resulted in no small alleviation of local rateable burdens.

Alderman SUDBURY revived the subject when moving the adoption, at last Tuesday's meeting of the Council, of a report of the Finance Committee which stated that they had interviewed Mr. Humphrys, and discussed with him the position to which he was appointed by a previous resolution as assistant-manager at £150 per annum. It had been agreed that he should perform such duties as he would from time to time be called upon to fulfil by the gas manager, and had expressed himself as satisfied with the arrangement. He voiced the hope that the controversy would now be at an end, and that the Council would unanimously accept the decision which had been arrived at.

Mr. MACDONALD, who had taken a prominent part in previous discussions, also expressed the hope that the last had now been heard of the difficulty.

The recommendation was adopted; but points of further importance were raised in relation to the operations now in progress at the gas-works, where the dismantled gasholder is being reinstated, with the substitution of a brick and puddle tank, as originally proposed, in place of a steel tank.

Mr. E. SMITH drew attention to the fact that at the previous meeting he stated that there was not a solitary minute recorded on the books with reference to the erection of the new gasholder; neither had such a minute ever come before the Council. The Town Clerk had repudiated this statement, referring to a minute which was recorded last September. It turned out that the minute was in connection with the brick and puddle tank absolutely, and had no bearing whatever upon the present gasholder. He therefore asked the Town Clerk, through the Mayor, to produce a minute authorizing the erection of a new gasholder.

The MAYOR said the gasholder which was being erected was not absolutely a new one, but the old one put in a new tank.

Mr. SMITH accepted the Mayor's explanation, but suggested that there were certain points in the work which were entirely new.

The MAYOR added that he could give Mr. Smith no further information on the point.

The TOWN CLERK (Mr. S. F. James) pointed out that the whole question had already been debated, and Mr. Smith had been told that if he would treat the matter as private he would be informed as to the true reason for framing the resolution in the way it was done. The estimated cost of the holder was £2304.

The Committee's report was adopted; and with the agreement revived regarding Mr. Humphrys' future status, it is hoped locally that the last has been heard of the personal element which was involved recently in many unpleasant discussions. But there is still a good deal of curiosity as to the outcome of the recent applications to the central authorities regarding loans for purposes of gas-works extension. Upon this head detailed information has so far been curiously lacking.

## NOTTINGHAM GAS EMPLOYEES' DEFIANCE.

Ignoring all appeals in favour of a reasonable settlement of points in dispute, a section of the Nottingham Corporation gas employees has carried defiance of the city authorities to the threatened ultimate extent. For over four months the door had been left practically open at the Woodborough Road gas-meter repairing depôt, to admit of the return of the tinsmiths, who, acting with the support of the National Amalgamation of Sheet Metal Workers and Braziers, had declined to resume operations upon any terms short of those representing the entire ostracism of non-union labour. The failure of the Mayor's intervention to bring about a settlement was necessarily followed by decisive action on the part of the Gas Committee, with the result that an intimation was forwarded individually to each of the men that his place was still open to him if he cared to come back, but that,


# Nelson

attributed many of his naval successes to the Carronade—a gun adopted by the Admiralty—which was manufactured at Carron Ironworks, and named after the place of its origin.

Likewise, the leading gas corporations largely attribute their successes to the Carron Gas Cooker—the cooker *par excellence*.

*New season's booklet free on request.*

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By Appointment Ironfounders to H.M. the King.

CARRON

failing a return to the shop by yesterday, steps would be taken to fill up the vacancies.

Characteristic of the conciliatory attitude which has throughout marked his conduct of the difficult negotiations, Mr. John Wilkinson (the Corporation Gas Engineer and Manager) in his letter to the disaffected hands observed that, in the delicate position in which he was placed, it was not for him to advise them in any way—adding that personally he was of opinion that it would be very much better for him to leave the matter entirely to their own judgment. But, as the temper which had been previously manifested made it tolerably certain would be the case, the last appeal found the men in the same obstinate mood as at the first stage of the trouble. And if—as did not appear at all probable from the external aspect of matters—there was any danger of wavering upon the part of any of those on strike, there was always evident the rod held *in terrorem* by the officials of the Union. The policy throughout has been dictated by the Central Executive, to whose mandates the men have yielded unfailing submission, with the result that, when the notices expired yesterday, there was no indication of any departure from the position hitherto taken up. It therefore now threatens to resolve itself into a struggle between Corporation authority and trade union autocracy. The men declare the inability of the Committee to replace those on strike by competent artificers; but despite the boasted solidarity of the ranks, it is likely to be seen before many days that the membership of the organization which has its headquarters at Clapham Road, London, does not necessarily exhaust all the skilled tinsmiths in the country.

Meanwhile, the development of the sympathetic strike idea upon the part of other Corporation workers is being awaited with interest. Present appearances do not indicate that any great amount of enthusiasm has been engendered on the part of the allied workers in other branches of the Nottingham Gas Committee's service, who have been hitherto quite content to let the tinsmiths fight their own battle. But after the many threatenings which have been heard during recent weeks as to conjoint action, it has been impossible that the matter could be allowed to go without some pretence at outward demonstration. The fiery harangues delivered a fortnight since at the annual demonstration under the auspices of the local branch of the National Gasworkers' Union, were designed to keep the feeling at fever heat, and the steps which are still in progress to test the general view of the Corporation workers have been organized to encourage the gas-meter repairers in their continued recalcitrancy. But whether the angry declarations which have been indulged in for the delectation of the strikers will materialize into action of the extreme character suggested, appears at present to be more than a little doubtful. The matter, however, has not been finally disposed of in this respect; it having been left until a meeting which is to be held on the 19th inst. to receive the reports of the several bodies concerned as to the result of the action which is being taken to test the feeling upon the question of an all-round stoppage of Corporation trade union employees.

In a letter in which apparently he seeks entirely to discount the value of the efforts of the Gas Committee to arrive at a settlement of the dispute, Mr. J. C. Gordon, the Secretary of the National Amalgamation, has made it clear that work will not be resumed if non-union labour is countenanced by the Committee. He sent a communication to the Town Clerk, in which he put upon the Committee the responsibility for the present position. With regard to their decision that unless the men returned to work by the 7th inst. their places would be filled, Mr. Gordon said that if this policy was adopted, his Committee would take what action they might deem necessary to meet the new situation created. He added that they had no desire that the dispute should be unduly prolonged, and they would at any time arrange for a deputation to discuss the matter further with the Committee, with the view of a settlement being reached. Meanwhile, the ban has been removed by the Executive of the Amalgamation from two private shops at which it was for a time in operation at Nottingham. But, failing some *modus vivendi*, the position appears to be for the present hopeless, so far as the Corporation depôt and the members of the trade union are concerned.

On the question of the threatened general strike, some expressions to which publicity has been given in the form of an interview with Mr. G. Thundercliffe, Secretary of the Nottingham Trades Council, are not without significance. Speaking since the contents of Mr. Gordon's reply to the Town Clerk became known, he appeared to be seeking in advance to excuse the possibility of any general concerted action upon the part of other trade unionists employed by the Corporation. In this connection, he has caused it to be known that if there is any seeming apathy on the part of the main body of organized workers in relation to the tinsmiths' difficulties, the latter ought to have settled the matter once and for all in regard to the employment of non-unionist labour at the Woodborough Road shops when they had the chance of doing so some years ago. Whatever may be the ultimate trend of events, the criticism of the Trades Council's Secretary seems, therefore, to afford very small comfort to the tinsmiths, who appear now likely, as from the first, to be left, for good or ill, to face the difficulty unaided, except for such cheap platitudes as the apostles of the boasted solidarity of labour care to pour out.

## ELECTRIC LIGHTING IN BERMONDSEY.

### Loss on Private Consumption Made Up by Charges for Street Lighting.

The accounts of the Electricity and Street Lighting Committee of the Bermondsey Borough Council for the year ended the 31st of March show that the total income was £25,187 (an increase of £1951), and that the total working expenses were £12,850. There was a gross profit of £12,779, equal to 6½ per cent. on the capital expenditure; but after repayment of loans, &c., the net surplus balance was only £80. This small sum was due to various causes, the principal being the increased price of coal owing to the strikes. Commenting on the accounts, the


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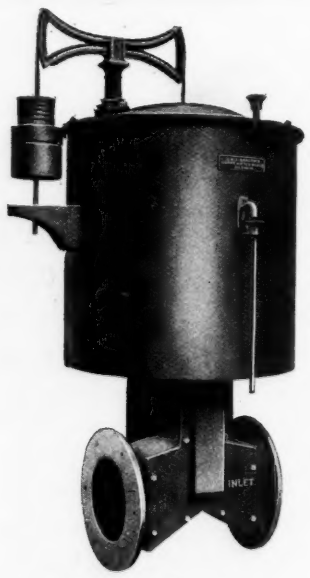


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Committee point out that the surplus estimated twelve months ago was £1546, whereas it was only £80, and this on a capital expenditure of nearly £200,000, of which £165,000 was still outstanding. The price paid by private consumers averaged 1·24d. per unit, and by the Council 1·708d., the cost of production being 1·312d. per unit; showing a loss by sales to private consumers of 0·072d. per unit, and a profit on the Council's consumption of 0·396d. The number of units sold for street lighting was 545,854; showing a profit of £900. A further profit made by the sale of current to the Council's various buildings and works was included in the sales to private consumers, and the accounts did not permit the amount of this additional profit to be stated. The Committee had previously pointed out that caution should be exercised in fresh borrowings. They now repeated and emphasized this advice, and suggested that no fresh loans should be sanctioned unless a sufficient price could be obtained from private consumers to put the undertaking upon a paying basis. They considered that the charge for street lighting and other services of the Council should be in close relationship to the cost price of current.

## BIRKENHEAD CORPORATION WATER SUPPLY.

### Progress of the Water Scheme.

An interesting statement regarding the progress of the new water scheme of the Birkenhead Corporation in North Wales was made by the Chairman of the Water Committee at the meeting of the Town Council last Wednesday.

Alderman BLOOR said the undertaking embraced the construction of two reservoirs—one called the Alwen and the other the Brenig; and it was anticipated that from both of them a total of 14 million gallons of water per day would be available. As the present consumption of the borough was from 4 to 4½ million gallons per day under normal conditions, the Council resolved to proceed with only the Alwen part of the scheme. This reservoir had been under construction for some time, and when completed it would deliver to Birkenhead 7 million gallons of water per day. The land the Council would have to acquire, and the easements, totalled 6500 acres. The actual extent of land bought was 2661 acres; while rights over 3776 acres have been purchased. The amount paid for the land was £46,000. In regard to the Brenig portion of the scheme, 5000 acres would have to be acquired, and up to the present the Council had actually purchased 3221 acres and easements over 191 acres, at a cost of £41,000. The difference between 3390 and 5000 acres in the second portion of the scheme had not been purchased, as, so far as could be judged, it would not be brought into operation within the next 25 years, and it might be 30 to 45 years. The Committee therefore wisely thought that the remainder of the purchase might safely be left over for their successors to complete. They had also acquired land and easements for the balancing tanks, at a cost of £25,000. The length of the pipe-line from the Alwen reservoir to Birkenhead would roughly be 42 miles; and they had secured the right to lay the aqueduct over a length of 10 miles of this distance. They had also purchased, at the site of the balancing-tanks, 47 acres of land; and plans with regard to the tanks and the aqueduct for conveying the water to Birkenhead were almost completed. The contract for the work at Alwen was let in January, 1911, for £186,000. Of this amount, £96,465 had been paid to the Contractors. The total amount expended on the scheme up to date was £281,611. This included the cost of land and easements, the cost of obtaining the Act of Parliament (which amounted to £16,000), compensation to various authorities, the payment to the engineers and contractors, and various other items.

## NOTES FROM SCOTLAND.

### From Our Own Correspondents.

*Saturday.*

**Edinburgh.**—At a meeting of the Edinburgh and Leith Gas Commissioners on the 30th ult., it was resolved to increase the wages of the blacksmiths by ¼d. per hour, and of the gas-fitters by ½d. per hour. It was also decided to appoint Miss Bella Carlow, at present a teacher of cookery in Stirling, to the position of Cookery Appliances Instructor, at a salary of £84 per annum—the duties to commence in October. The minutes of the Works Committee were approved which authorized the extension of the gas-main from Greenend to Gilmerton, for the purpose of supplying the village and a laundry with gas. Mr. Masterton, the Engineer and Manager, estimated the total cost at about £800; and the opinion is expressed that the Commissioners should be able to obtain about 200 consumers. On the basis of the average consumption of premises in the city similar to those at Gilmerton, it is reckoned that the annual revenue, at the county rate of 3s. 2d. per 1000 cubic feet, should be between £350 and £400.

**Glasgow.**—The Corporation have been in litigation with one of the landlords in the areas recently included in the city boundaries over the question of the lights provided by him for the common stairs of certain buildings in Partick. The proprietor had, in 1909, provided certain incandescent lanterns according to the then requirements of the local lighting authority. These had given satisfaction, and were in thoroughly good condition. It was considered by him as oppressive on the part of the Glasgow Corporation to require him to put new lamps throughout. This contention has been upheld by the Stipendiary; but the Procurator-Fiscal has applied for a stated case for the High Court of Justiciary.

**Bellshill.**—The Gas Company held their eleventh annual meeting on Tuesday, at which it was decided to pay a dividend of 10 per cent., free of income-tax.

**Castle-Douglas.**—The Gaslight Company have agreed to pay a


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dividend of 7 per cent. and a bonus of 3 per cent. upon the capital stock of the Company. The price of gas is to be continued at 3s. 6½d. per 1000 cubic feet.

**Kirkcaldy.**—The Gas Committee announce that an increase in the price of gas will take place, entirely owing to the higher cost of coal, which is up 4s. per ton in the last four years. The estimated deficiency is £1440. It was also decided to spend £130 in extending the mains to Southerton. In the case of free way-leave being refused by the County Council, these pipes will be taken through Beveridge Park.

**Lanark.**—The decision to accept the sum of £16,000 offered by the Town Council was adhered to at the meeting of the shareholders of the Lanark Gas Consumers' Company on Tuesday, so that the Company will shortly cease to exist.

**Leslie.**—The report of the Directors was before the annual meeting of shareholders on Tuesday, when Bailie Smart presided. Increases in sales and reduced leakage were indicated. The dividend of 7½ per cent. is the usual, in spite of a special outlay of £300. The retiring Directors were re-elected with the exception of Mr. James Orr, who resigns, and whose place is taken by Mr. W. H. Hume.

**Leven.**—The Directors of the Leven Gas Company have decided that, in the interest of the shareholders, they cannot make a reduction in the price of gas, as the coal bill will be increased by between £500 and £600. It is expected, however, that possibly next year a reduction may be made. Mr. A. Hogg was re-elected Chairman of the Board for the seventh year in succession. The staff of the Company have presented Mr. Lawrence Kerr with a beautiful clock, on the occasion of his marriage.

## CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *July* 5.

**Sulphate of Ammonia.**

Throughout the week the market for this material has shown little animation; immediate requirements having evidently been covered, and buyers not having been keen to operate for July delivery. There has, however, not been any pressure on the part of makers to effect sales, and values have been fairly well maintained. The closing quotations are £12 16s. 3d. per ton f.o.b. Hull, £12 17s. 6d. per ton f.o.b. Liverpool, and £13 per ton f.o.b. Leith. In the forward position, there is no new feature to comment upon; and no further business is reported to have been done by either producers or dealers.

**Nitrate of Soda.**

There is no change in either the tone or the value of this article; to-day's prices still being 10s. 7½d. per cwt. for ordinary and 10s. 9d. for refined quality, on spot.

LONDON, *July* 7.

**Tar Products.**

The market for pitch has been in a peculiar position for some weeks past. The majority of makers do not believe in the permanency of the fall which has taken place, and are holding for better prices; but, on the other hand, some quantity has been sold for prompt and forward delivery at prices varying from 40s. to 41s. 6d. per ton, according to port and position. With regard to consumers, in every case orders which have been taken lately have been accepted at figures which, reckoning on current rates, will not leave more than 40s. 6d. to 41s. 6d. per ton f.o.b. the most favourable English ports. In Manchester, the distillers are particularly firm in their idea, and are presenting perhaps the greatest resistance to a fall in prices. Whether or not they will be successful in their endeavour remains to be seen. Ninety per cent. benzol keeps firm for the prompt position; but there appears to be a little more offering for the forward, though no material lowering of price has been marked. Solvent naphtha continues quiet, and no sales of importance are reported in this article. Crude carbolic is practically a dead letter. The difference in opinion between buyers and sellers prevents business. Creosote keeps fairly steady, though sales are reported for the country makes at certainly very reasonable prices.

The average values during the week were: Tar, 25s. 3d. to 29s. 3d. Pitch, London, 41s. to 42s.; east coast, 40s. 6d. to 41s. 6d.; west coast, Manchester, 40s. to 41s.; Liverpool, 41s. to 42s.; Clyde, 41s. to 42s. Benzol, 90 per cent., naked, London, 1s. 0½d. to 1s. 1d.; North, 1s. to 1s. 0½d.; 50-90 per cent., naked, London, 10d. to 10½d.; North, 10d. Toluol, naked, London, 11d. to 11½d.; North, 10¾d. to 11d. Crude naphtha, in bulk, London, 5¼d. to 5⅜d.; North, 4¾d. to 5¼d. Solvent naphtha, naked, London, 11d. to 11½d.; North, 9d. to 9½d. f.o.b. Heavy naphtha, naked, London, 11½d. to 1s. f.o.b.; North, 10d. to 10½d. f.o.b. Creosote, in bulk, London, 3⅛d. to 3¼d.; North, 2⅞d. to 3d. Heavy oils, in bulk, 3¼d. to 3⅜d. Carbolic acid, casks included, 60 per cent., prompt, east and west coasts, 1s. 3d. to 1s. 3½d. Naphthalene, £5 to £9; salts, 50s. to 55s., bags included. Anthracene, "A" quality, 1½d. to 1⅝d. per unit, packages included and delivered.

**Sulphate of Ammonia.**

Business is still exceedingly quiet in this article; and although efforts in several quarters are made to excite some interest, they do not meet with success. Foreign orders are scarce, and buyers seem quite indifferent as to whether or not they purchase. Outside London makes are still quoted at £12 5s.; Hull, £12 16s. 3d.; Liverpool, £12 17s. 6d.; Leith, £12 18s. 9d. to £13; Middlesbrough, £12 16s. 3d. to £12 17s. 6d.

**Manchester District Tar Prices.**

It is officially announced that the average price realized for May deliveries of tar in the Manchester district—based on the value of the products—was 36s. 7d. per ton.

A wire received Saturday afternoon states: Tar products are in good demand, and prices are maintained, excepting carbolic. For pitch, 43s. 6d. has been offered and refused for Liverpool delivery for a large quantity. The attempt to depress pitch is artificial and unjustifiable.


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## COAL TRADE REPORTS.

### Northern Coal Trade.

There is more inquiry in the coal trade of the North, and orders are being given out for both Northumbrian and Durham coals. For steam coals, best Northumbrians are from 14s. 9d. to 15s. per ton f.o.b.; second-class steams are about 13s. 3d.; and steam smalls are from 8s. to 9s. 6d. Some large lots of best steams are believed to have been placed for Russia at 20s. 3d. to 20s. 4½d. delivered. In the gas coal trade, the market is steady, with a slow increase in the consumption, and more disposition to begin stocking. Best Durham gas coals are from 14s. 7½d. to 14s. 9d. per ton f.o.b. For second-class gas coals, 13s. 4½d. per ton is quoted; and "Wear specials" are about 15s. 3d. For the Aarhuus Gas-Works, tenders are asked for about 22,000 tons of special Durham coals, delivered over the year. Nothing has yet transpired as to the results of the tenders for coal for the Darlington Gas-Works; but it was incidentally remarked at the meeting of the Council that the cost of the coal would be very largely increased. Coke is steady. Gas coke is firm at 18s. per ton f.o.b. for good export kinds.

### Scotch Coal Trade.

The coal trade throughout Scotland is practically unchanged since the last report; and on Friday, on the Glasgow Coal Exchange, the following were the approximate prices quoted: Ell (best brands), 12s. 9d.; splint, 13s. to 15s.; navigations, 16s. 6d.; ordinary steams, 11s. 6d. to 12s. 6d.; Hartleys, 14s. 6d.; trebles, 12s. to 12s. 6d.; doubles, 11s. 9d.; singles, 11s. 3d.; pearls, 10s. 6d.; and dross, 8s. to 8s. 6d., f.o.b. Glasgow.

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The West Staffordshire Gas Company, Limited, has been registered with a capital of £7000, in £1 shares, to acquire the business and undertaking of the Breward Gas-Works.

## Proposed Acquisition of the Portsmouth Gas-Works by the Corporation.

A proposal to acquire the Portsea Island Gas Company's works is the latest "fad" in the municipal life of Portsmouth, writes our local correspondent; but it is still in its infancy—the scheme having to be formulated to the satisfaction of the proprietors of the Company's stock and to the ratepayers. It was about three years ago that the same Town Council enthusiastically promoted the acquisition of the undertaking of the Water Company; but almost at the last moment they dropped the proposal, which had been accurately detailed in a financial report. With respect to the latest proposals which the Finance Committee of the Town Council have put forward, Corporation stock is to be allotted to each gas shareholder to produce a sum equal to that which each may now be receiving in dividends. But doubt is entertained whether the proprietors will be content with this, as many of them have paid large premiums for their shares, which they will be unable to regain by the sale of Corporation stock. When the subject is debated openly in the Town Council, much will doubtless be made of the growing success of the municipal electricity undertaking; and the discussion will also include the consideration of the interest involved on the required great loan by the borough, which already has a bank overdraft of many thousand pounds.

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**Stockport Gas-Works Mishap.**—The mishap at Huddersfield, reported last week, whereby unpurified gas found its way into the mains, has been followed by a similar experience at Stockport. According to a local paper, last Saturday week a quantity of unpurified gas passed forward to the consumers, in some cases affecting workpeople to such an extent that work had to be stopped. Naturally the presence of the impure gas was chiefly noticeable in places where large quantities are consumed for power purposes. The matter was soon put right.

## GAS COMPANIES' STOCK AND SHARE LIST.

The improvement noted a week ago in the general tone of things on the Stock Exchange has been but short-lived, and a disheartening reaction has quickly succeeded. The chief factors of depression were the embroglio in the Balkans and the alarming development of the South African labour trouble. These, coming upon already severely tried markets, pretty well crushed the life out of them. Almost absolute stagnation results; for even the boldest buyers hesitate now. Prices, of course, have fallen freely; and none worse than the best gilt-edged. Consols crumbled away till on Saturday they touched 72½—the record lowest figure. The opening day was pretty fair, though business was very slack; and, in spite of Balkan rumours and the Rand strike, Consols were firm, Rails made some advances here and there, and American were stronger. Tuesday's intelligence, however, was quite discouraging, and quotations were lowered generally. Consols receded ¼, Rails were dull and flat, and American lower; but the closing figures were not the worst of the day. Wednesday opened very cautiously indeed—awaiting Balkan and Kaffir developments. Eventually, movements were irregular. Government issues were flat, and Consols dropped ¼. But Rails and American were livelier; and the Foreign Market was fair. Everything was very flat on Thursday—unable to stand up against the depressing factors in operation. Consols lost another ½, Rails were heavy and drooped for lack of support, and the rest were sympathetic. Friday was quieter than ever, and business was almost at a standstill. The markets were so shy that anything touched gave way at once. Prices throughout were lower, and Consols dropped to 72½. Saturday was almost a *dies non*. The attendance was most meagre; and nobody cared to do anything. Consols were done at the record figure of 72½—a fall of ½ in the day, and ⅞ in the week. In the Money Market, rates eased with the turn of the half year; but discount quotations were very firm, in view of the general outlook of affairs. Business in the Gas Market continued very quiet, and was generally devoid of interest or any characteristic feature. As in last week, transactions were limited to fewer than a dozen undertakings; and eight of these averaged only a couple of deals apiece. Changes of quotation were few, slight, and irregular. In Gaslight and Coke issues, the ordinary was in moderate activity and steady, changing hands at par to 100¾. In the secured issues, the maximum marked 76 (a fall of 1), the preference 95½ to 98 (a rise of 1), and the debenture 72½ and 73½. South Metropolitan was quiet and firm at 108¼ to 109½; and the debenture marked 74½. In Commercials, there was one bargain in the debenture at 69½. Among the Suburban and Provincial group, Alliance and Dublin realized 70⅛ to 71 (a fall of 1), and Brighton and Hove original 210. In the Continental companies, Imperial changed hands at 163 to 165, and European at 17 13/16 to 18 1/16. Among the undertakings of the remoter world, Melbourne was marked at 98½, Monte Video at 12⅞, Oriental at 128, Primitiva at 5 15/16 to 6⅛, ditto preference at 4 13/16 to 5 (a rise of 1/16), and ditto debenture at 93½.

| Issue. | Share. | When ex. Dividend. | Dividend or Dividend & Bonus. | NAME. | Closing Prices. | Rise or Fall in Wk. | Yield upon Investment. |
|---|---|---|---|---|---|---|---|
| £ | | | p.c. | | | | £ s. d. |
| 1,551,868 | Stk. | April 11 | 5 | Alliance & Dublin Ord. | 69—72 | −1 | 6 18 11 |
| 374,000 | ,, | Jan. 16 | 4 | Do. 4 p.c. Deb. | 84—87 | .. | 4 12 0 |
| 280,000 | 5 | April 11 | 7⅛ | Bombay, Ltd. | 6⅞—6¾ | .. | 5 11 1 |
| 50,000 | 10 | Feb. 27 | 15 | Bourne- mouth Gas & Water | 10 p.c. | .. | 5 1 8 |
| | | | | | B 7 p.c. | .. | 4 7 6 |
| | | | | | Pref. 6 p.c. | .. | 4 4 3 |
| 332,000 | 10 | ,, | 7 | | 15½—16 | .. | |
| 75,000 | 10 | ,, | 6 | | 13⅞—14½ | .. | |
| 380,000 | Stk. | Feb. 27 | 14 | Brentford Consolidated | 260—265 | .. | 5 5 8 |
| 330,000 | ,, | ,, | 11 | Do. New | 200—205 | .. | 5 7 4 |
| 50,000 | ,, | ,, | 5 | Do. 5 p.c. Pref. | 113—115 | .. | 4 6 11 |
| 206,250 | ,, | June 13 | 4 | Do. 4 p.c. Deb. | 92—94 | .. | 4 5 1 |
| 217,380 | Stk. | Feb. 27 | 11 | Brighton & Hove Orig. | 206—211 | .. | 5 4 3 |
| 244,200 | ,, | ,, | 8 | Do. A Ord. Stk. | 151—154 | .. | 5 3 11 |
| 530,000 | 20 | Mar. 28 | 12½ | British | 45—46 | .. | 5 8 8 |
| 120,000 | Stk. | June 27 | 4 | Do. 4 p.c. Deb. Stk. | 87—89* | .. | 4 9 11 |
| 245,771 | Stk. | ,, | 4 | Buenos Ayres 4 p.c. Deb. | 89⅛—91⅛* | .. | 4 7 5 |
| 100,000 | 10 | — | — | Cape Town & Dis., Ltd. | 2—3 | .. | — |
| 100,000 | 10 | — | — | Do. 4½ p.c. Pref. | 4—5 | .. | — |
| 100,000 | Stk. | June 27 | 4½ | Do. 4½ p.c. Deb. Stk. | 75—80* | .. | 5 12 6 |
| 167,150 | Stk. | Feb. 13 | 5 | Chester 5 p.c. Ord. | 109½—111½ | .. | 4 9 8 |
| 1,513,280 | Stk. | Feb. 27 | 5/9/4 | Commercial 4 p.c. Stk. | 105—107 | .. | 5 2 1 |
| 560,000 | ,, | ,, | 5½ | Do. 3½ p.c. do. | 102—104 | .. | 5 2 6 |
| 475,000 | ,, | June 13 | 3 | Do. 3 p.c. Deb. Stk. | 69—71 | .. | 4 4 6 |
| 800,000 | Stk. | ,, | 4 | Continental Union, Ltd. | 80—83 | .. | 4 16 5 |
| 200,000 | ,, | ,, | 7 | Do. 7 p.c. Pref. | 124—126 | .. | 5 11 1 |
| 492,270 | Stk. | — | 6¾ | Derby Con. Stk. | 124—125 | .. | 4 12 0 |
| 55,000 | ,, | — | 4 | Do. Deb. Stk. | 103—105 | .. | 3 16 2 |
| 1,002,180 | 10 | Jan. 16 | 10 | European, Ltd. | 17½—18½ | .. | 5 8 1 |
| 16,415,840 | Stk. | Feb. 13 | 4/17/4 | Gaslight and Coke | 4 p.c. Ord. | .. | 4 15 10 |
| | | | | | 3½ p.c. max. | .. | 4 8 7 |
| 2,600,000 | ,, | ,, | 8½ | | 76—79 | −1 | |
| 4,062,235 | ,, | ,, | 4 | and Coke | 4 p.c. Con. Pref. | .. | 4 1 8 |
| 4,674,850 | ,, | June 13 | 3 | | 3 p.c. Con. Deb. | .. | 4 1 8 |
| 258,740 | Stk. | Mar. 13 | 5 | Hastings & St. L. 3½ p.c. | | .. | 5 9 11 |
| 82,500 | ,, | ,, | 6½ | Do. do. 5 p.c. | — | .. | — |
| 70,000 | 10 | April 25 | 11 | Hongkong & China, Ltd. | 17—17½ | .. | 6 5 9 |
| 131,000 | Stk. | Mar. 13 | 7⅜ | Ilford A and C | 152—155 | .. | 4 18 4 |
| 65,780 | ,, | ,, | 6⅜ | Do. B | 120—122 | .. | 5 0 5 |
| 65,500 | ,, | June 27 | 4 | Do. 4 p.c. Deb. | 87—89* | .. | 4 9 11 |
| 4,940,000 | Stk. | May 16 | 9 | Imperial Continental | 161—166 | .. | 5 8 5 |
| 1,335,000 | Stk. | Feb. 13 | 3½ | Do. 3½ p.c. Deb. Red. | 85—87 | .. | 4 0 6 |
| 200,242 | Stk. | Mar. 13 | 6 | Lea Bridge Ord. 5 p.c. | 120—123 | .. | 4 17 7 |
| 561,000 | Stk. | Feb. 27 | 10 | Liverpool United A | 208½—210½ | .. | 4 15 0 |
| 718,100 | ,, | ,, | 7 | Do. B | 150—152 | .. | 4 12 1 |
| 306,083 | ,, | June 27 | 4 | Do. Deb. Stk. | 96—98* | .. | 4 1 8 |
| 63,480 | Stk. | June 27 | 3 | Maidstone 3 p.c. Deb. | 66⅛—68½* | .. | 4 7 7 |

| Issue. | Share. | When ex. Dividend. | Dividend or Dividend & Bonus. | NAME. | Closing Prices. | Rise or Fall in Wk. | Yield upon Investment. |
|---|---|---|---|---|---|---|---|
| £ | | | p.c. | | | | £ s. d. |
| 75,000 | 5 | June 13 | 6 | Malta & Mediterranean | 4⅛—4⅞ | .. | 6 3 1 |
| 250,000 | 100 | April 1 | 4½ | Met. of Melbourne | 4½ p.c. Deb. | 98—100 | .. 4 10 0 |
| 541,920 | 20 | May 30 | 4 | Monte Video, Ltd. | 12½—13 | .. | 6 3 1 |
| 1,775,892 | Stk. | Feb. 27 | 4½ | Newc'tle&G'tesh'd Con. | 98—99 | −½ | 4 10 11 |
| 529,705 | Stk. | June 27 | 3½ | Do. 3½ p.c. Deb. | 83½—84½* | .. | 4 2 10 |
| 55,940 | 10 | Feb. 27 | 7/7/0 | North Middlesex 7 p.c. | 13—14 | .. | 5 4 7 |
| 300,000 | Stk. | May 16 | 8 | Oriental, Ltd. | 124—129 | .. | 6 4 0 |
| 60,000 | 5 | Mar. 28 | 10 | Ottoman, Ltd. | 8—8½ | .. | 5 17 8 |
| 60,000 | 50 | Feb. 27 | 13 | Portsea, Island B | 125—128 | .. | 5 1 7 |
| 100,000 | 50 | ,, | 12 | Do. C | 122—125 | .. | 4 16 0 |
| 249,980 | 5 | May 16 | 8 | Primitiva Ord. | 5 15/16—6⅛ | .. | 6 8 0 |
| 499,960 | 5 | June 27 | 5 | ,, 5 p.c. Pref. | 4 13/16—5* | +1/16 | 5 0 0 |
| 521,600 | 100 | June 2 | 4 | ,, 4 p.c. Deb. | 93—95 | .. | 4 4 3 |
| 346,198 | Stk. | June 27 | 4 | River Plate 4 p.c. Deb. | 90—92* | .. | 4 7 0 |
| 275,000 | 5 | Apl. 11 | 12 | San Paulo, Ltd. | — | .. | — |
| 150,000 | 10 | ,, | 6 | Do. 6 p.c. Pref. | 11¼—11⅞ | .. | 5 2 2 |
| 125,000 | 50 | July 1 | 5 | Do. 5 p.c. Deb. | 48—50* | +½ | 5 0 0 |
| 135,000 | Stk. | Mar. 13 | 10 | Sheffield A | 225—227 | .. | 4 8 1 |
| 209,984 | ,, | ,, | 10 | Do. B | 225—227 | .. | 4 8 1 |
| 523,500 | ,, | ,, | 10 | Do. C | 225—227 | .. | 4 8 1 |
| 90,000 | 10 | May 30 | 7½ | South African | 9½—10½ | .. | 7 2 10 |
| 6,429,895 | Stk. | Feb. 13 | 5/9/4 | South Met., 4 p.c. Ord. | 108—110 | .. | 4 19 4 |
| 1,895,445 | ,, | Jan. 16 | 3 | Do. 3 p.c. Deb. | 73—75 | .. | 4 0 0 |
| 209,820 | Stk. | Feb. 27 | 8½ | South Shields Con. Stk. | 161—164 | .. | 5 4 4 |
| 952,795 | Stk. | Feb. 27 | 6 | S'th Suburb'n Ord. 5 p.c. | 117—119 | .. | 5 0 10 |
| 60,000 | ,, | ,, | 5 | Do. 5 p.c. Pref. | 115—117 | .. | 4 5 6 |
| 117,058 | ,, | June 27 | 5 | Do. 5 p.c. Deb. Stk. | 115—117* | .. | 4 5 6 |
| 694,740 | Stk. | May 16 | 5 | Southampton Ord. | 102—105 | .. | 4 15 3 |
| 120,000 | Stk. | Feb. 13 | 7½ | Tottenham A 5 p.c. | | 139—142 | .. 5 2 1 |
| 483,940 | ,, | ,, | 5½ | and B 3½ p.c. | | 115—117 | .. 4 18 3 |
| 149,470 | ,, | June 27 | 4 | Edmonton 4 p.c. Deb. | | 90—92* | .. 4 7 0 |
| 182,380 | 10 | ,, | 5 | Tuscan, Ltd. | 5—6 | .. | 8 6 8 |
| 149,900 | 10 | July 1 | 5 | Do. 5 p.c. Deb. Red. | 94—96* | .. | 5 4 2 |
| 236,476 | Stk. | Feb. 27 | 5 | Tynemouth, 5 p.c. max. | 114—115 | .. | 4 6 11 |
| | | | | Wandsworth, Wimbledon, and Epsom— | | | |
| 30,000 | Stk. | .. | .. | Wandsworth A 5 p.c. | 160—165 | .. | — |
| 255,636 | ,, | .. | .. | ,, B 3½ p.c. | 132—137 | .. | — |
| 108,075 | ,, | .. | .. | ,, C 3½ p.c. | 118—118 | .. | — |
| 352,000 | ,, | .. | .. | Wimbledon 5 p.c. | 110—115 | .. | — |
| £8,£00 | ,, | .. | .. | Epsom 5 p.c. | 117—122 | .. | — |
| 88,416 | ,, | June 27 | 3 | 3 p.c. Deb. Stk. | 68—70* | +2½ | 4 5 9 |

Prices marked * are "Ex-Div."

## Public Lighting at Nottingham.

In connection with the information published in the "JOURNAL" last week regarding the improved public lighting arrangements at Nottingham, it should have been mentioned that, in addition to the firms whose names were given, an important part of the work has been carried out by Messrs. Hutchinson Bros., Limited, of Barnsley, who have been responsible for the conversion of the long line of burners on the Gregory Boulevard. The change effected here, as at Sneinton Dale, where Messrs. Hutchinson's lamps have also been installed, at a point at which several roads converge, has given much satisfaction; the firm having likewise been entrusted with similar work in neighbouring urban areas, including Beeston, Carlton, Gedling, Burton Joyce, Cossall, and most of the parishes within the Basford Council authority's extensive district, where the new lamps have effected a striking improvement.

## Glover and Main's Workmen's Outing.

The outing of the workmen engaged at Messrs. Glover and Main's Gothic Works, Edmonton, took place at Hastings last Saturday, when nearly 600 of the staff and men, and a few visitors, were entertained by the firm. On arrival at Hastings soon after ten o'clock, the party assembled at the County Cricket Ground to go through a programme of sports under "A.A.A." Laws. All the events were keenly contested—more especially the "tug of war." The sixty-fourth annual dinner was held subsequently at the Royal Concert Hall, Warrior Square, St. Leonard's, and proved a huge success. Following the repast, came the distribution of the prizes won in the morning; and then the Chairman, Mr. Thomas Glover, speaking for the Company, offered some words of hearty welcome, especially singling out one of the workmen, who, as far back as 1858, took part in a somewhat similar festival held at Woodford. He was called on to the platform; and, in a bright speech, Mr. Glover pointed out how much the firm were indebted to many of the old hands, whom they were glad to see year after year in this way. He concluded by saying that the Directors thought it right (after all his years of faithful service) to offer him a retiring allowance equivalent to his full wages at the present time. Afterwards, Mr. Glover proposed a toast to include all his guests; and this was responded to by Mr. A. P. Main, for the Directors of the Company, by Mr. C. E. Botley for the "Town of Hastings and its Gas Company," by Mr. A. E. Broadberry (Tottenham) for the visitors, by Mr. W. Batt (Manchester) for the firm's representatives, and by Messrs. Ritchie, Earp, and Harper for the different branches of the manufacturing establishment.

**Carlisle Gas and Electricity Profits.**—The accounts of the Carlisle gas and electricity works show that for the year ending March 31 last the gross profit on the gas undertaking was £12,848, and the net profit £8608. In the electricity department, the gross profit was £8736, and the net £1509. Last year the net profit on the gas-works was £8552, and on the electricity works £3340.

**Gas Explosion at the Wandsworth Town Hall.**—A gas explosion which occurred at the Wandsworth Town Hall last Tuesday caused considerable damage. The hallkeeper, Mr. Clarke, and his wife were having their dinner in the residential portion of the hall, when they were startled by the sound of an explosion and by a sheet of flame which came through the kitchen doorway. On investigation, they discovered that the gas supplying the cooking-stove had exploded. The windows of the kitchen were blown out, and the stove was wrecked. Mrs. Clarke had a very narrow escape, having left the stove only about half-a-minute previously. Fortunately, no one in the building sustained any injury.

## Lighting of East Ham Schools.

In connection with a lecture which Mr. H. H. Creasey, of the Gaslight and Coke Company, delivered at East Ham some weeks ago [see "JOURNAL" for May 27, p. 606], reference was made to the lighting of the local schools; and those present—members of the East Ham Ratepayers' and Burgesses' Association—passed a resolution stating their opinion that the best interests of the ratepayers would be served by not proceeding with the electric lighting of any of the schools, and that the present gas lighting was out of date, and should be remodelled as soon as possible. It was also suggested that a further meeting should be held. No doubt as an outcome of this, a meeting convened by the Municipal Alliance took place on Monday of last week, when it was decided to request the Town Council to improve the present lighting by adopting a system of incandescent burners; and the Council's decision to instal electric lighting at the Central Park School was protested against. Mr. Thomas pointed out that the Council proposed to spend £424 on installing electricity at the school named; and Mr. Williams added that for the same amount six schools could be illuminated by incandescent gas. Councillor Cashman stated that twenty of the schools were lighted by gas; and he maintained that it would be a wicked waste of public money to scrap the gas-pipes and substitute electric light at a cost of thousands of pounds, when, by fixing incandescent burners, they could obtain as good a light as one could wish for. Councillor Oakes remarked that, after very careful consideration, the Council came to the conclusion that the electric lighting of Central Park School would be cheaper in the end. The sum of £424 had been reduced to something like £360. The school had had incandescent burners since its erection; and they had always been a failure. Mr. Fletcher expressed his belief that the fact of their being in the electricity business was the chief reason for the Council's attitude in regard to this school.

**Davis's Gas Geysers.**—In a neat little pamphlet which the Davis Gas-Stove Company, Limited, have just issued, they give illustrations and particulars of the various geysers made by them, and offer a few useful hints to buyers to enable them to obtain hot water at any time with economy and comfort.

**Dublin Gas Company and Electric Lighting.**—The Alliance and Dublin Gas Company have intimated to the Blackrock and Dalkey Urban District Councils that they intend to apply to the Board of Trade before the close of the year for powers to supply electricity for public and private purposes within the urban areas.

**Gas for Power Purposes at Bradford.**—A Sub-Committee of the Bradford Corporation Gas Committee are considering a proposed reduction in the price of gas from 2s. 1d. to 1s. 6d. per 1000 cubic feet to gas-engine users, with a view to encouraging the use of this class of engine. The loss involved by the reduction would, it is estimated, necessitate the making and selling of 35 million cubic feet more gas per annum in order to maintain the income of the department.

**A Sequel to the Bayswater Sewer Fatality.**—At a recent meeting of the London County Council, the Fire Brigade Committee reported that a letter had been received from the Gaslight and Coke Company expressing their regret at the deaths of the victims in the sewer fatality at Bayswater a short time ago; offering to contribute, as an expression of the Company's sympathy, the sum of £105 to the London Fire Brigade Widows' and Orphans' and General Benefit Fund; and asking whether this offer met with the concurrence of the Council. The Committee said they did not see any objection to the proposed payment; and they recommended that the Company should be informed accordingly.

## WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

### Appointments, &c., Vacant.

ASSISTANT ENGINEERS (Three). Sheffield Water Department. Applications by July 25.
ASSISTANT DISTRICT SUPERINTENDENT. No. 5760.
DISTRIBUTION DEPARTMENT. Romford Gas Company.
REPRESENTATIVE (Lighting). Sutherland Meter Company, Birmingham.
JUNIOR CLERK. Smethwick Gas Department. Applications by July 18.

### Appointments, &c., Wanted.

SELLING DEPARTMENT. No. 5759.
CHEMICAL PLUMBER. Davies, Galloway Road, Shepherd's Bush, W.

### Gas-Works Wanted.

D. GORDON, 31, New Bond Street, W.

### Sales of Stocks and Shares.

SOUTHAMPTON GASLIGHT COMPANY. By Tender. July 21.

### Plant, &c. (Second Hand) Wanted.

AMMONIA STILL. No. 5757.
LIVESEY WASHER. No. 5758.
PRESSURE RAISERS. Park, 89, Fleet Street, E.C.

### Meetings.

COMMERCIAL GAS COMPANY. Cannon Street Hotel, Aug. 21. Twelve o'clock.
SOUTH SUBURBAN GAS COMPANY. De Keyser's Hotel. Aug. 8. Three o'clock.
TOTTENHAM AND EDMONTON GAS COMPANY. Works. Aug. 9. Three o'clock.

### TENDERS FOR

#### Coal.

EXMOUTH GAS COMPANY. Tenders by July 29.
HAVERHILL URBAN DISTRICT COUNCIL. Tenders by July 15.
SLIGO GAS COMPANY. Tenders by July 17.
TORQUAY GAS-WORKS COMMITTEE. Tenders by July 21.

#### Elevator Framework (Renewal).

MIDDLETON GAS DEPARTMENT. Tenders by July 9.

#### Exhausters.

BANGOR (CO. DOWN) URBAN DISTRICT COUNCIL. Tenders by July 18.

#### Retort Settings and Bench Mountings.

COCKERMOUTH GAS DEPARTMENT. Tenders by July 18.

#### Tar and Liquor.

ROTHERHAM GAS DEPARTMENT. Tenders by July 21.

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